



Philip Earl Stanhope.

PHILOSOPHICAL
TRANSACTIONS,

GIVING SOME

A C C O U N T

O F T H E

Present Undertakings, Studies, *and* Labours,

O F T H E

I N G E N I O U S,

I N M A N Y

Confiderable Parts of the W O R L D.

VOL. XLVI. For the Years 1749 and 1750.

L O N D O N:

Printed for C. DAVIS, PRINTER to the ROYAL
SOCIETY, over-against *Gray's-Inn-Gate* in *Holbourn*.

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THIS XLVI Volume of the *Philosophical Transactions* concludes those publish'd by the late *Cromwell Mortimer*, M. D. *Secretary* of the *Royal Society*; the last Number being printed off just before his Death on the 7th of January 1752.

PHILOSOPHICAL TRANSACTIONS.

For the Months of *Jan. Febr. and March.* 1749.

- I. *A Letter from the Rev. Henry Miles D. D. & F. R. S. to Martin Folkes Esq; Pr. R. S. concerning Thermometers, and some Observations of the Weather.* p. 1.
- II. *An Account of the Case of a Clergyman's Lady, at Cottered near Baldock in Hertfordshire, who had a Stone under her Tongue, by Wm. Freeman Esq; F.R.S.* p. 5.
- III. *An Account of Glasses of a new Contrivance, for preserving Pieces of Anatomy or Natural History in spirituous Liquors, by Claud. Nic. le Cat, M. D. F. R. S. Royal Demonstrator in Anatomy and Surgery at Roan.* p. 6. & 88.
- IV. *Observationes aliquæ astronomicæ à Reverendo P. P. Suarez è S. J. in Paraquaria habitæ, et per D. Suarez M. D. cum Soc. Regali communicatæ.* p. 8.
V.

The CONTENTS

- V. *Observatio Eclipsis solaris Julii 14, et Lunæ Julii 2^o, 1747. Madiræ habitæ à Domino Antonio de Ulloa R. S. S. p. 10.*
- VI. *Remarks on the principal Paintings found in the subterraneous City of Herculeum, and at present in the Possession of the King of Naples; by ——— Biondeau Esq; communicated by Tho. Stack M. D. & F. R. S. p. 14.*
- VII. *An Account of a new invented arithmetical Instrument called a Shwan-pan, or Chinese Accompt-Table; by Gamaliel Smethurst. p. 22.*
- VIII. *Extract of a Letter from Benj. Heath Esq; to Peter Davall Esq; Secr. R. S. inclosing a Proposal for intirely removing the only real Defect in the lateral Operation for the Stone; by Mr. John Mudge Surgeon at Plymouth. p. 24.*
- IX. *An Account of the Locusts, which did vast Damage in Walachia, Moldavia, and Transilvania, in the Years 1747 and 1748; and of some Swarms of them, which, in the Months of July and August 1748. came into Hungary and Poland; by a Gentleman who lives in Transilvania. p. 30.*
- X.

The CONTENTS.

- X. *A Letter from Mr. Henry Baker F.R.S. to the President, concerning some Vertebræ of Ammonitæ, or Cornua Ammonis; communicated to Mr. Baker by the Rev. Dr. Miles F. R. S.* p. 37.
- XI. *The Case of Mr. Smith, Surgeon at Sudbury in Suffolk; the Coats of whose Stomach were changed into an almost cartilaginous Substance; communicated by the Rev. Mr. Murdock to Cromwell Mortimer M. D. Secret. R. S.* p. 39.
- XII. *A Catalogue of the FIFTY PLANTS from Chelsea-Garden, presented to the Royal Society by the Company of Apothecaries, for the Year 1746. pursuant to the Direction of Sir Hans Sloane Bart. Med. Reg. & nuper Soc. Reg. Præf.; by Jos. Miller Apothecary, Hort. Chelf. Præf. ac Prælect. Botan.* p. 43.
- XIII. *The Reverend Mr. Robert Clarke to Mr. Fleming, concerning a Boy, who had a Calculus formed between the Glans and the Præputium.* p. 45.
- XIV. *The Establishment of a new Genus of Plants, called Salvadora, with its Description; by Laurence Garcin M. D. F. R. S.*
of

The CONTENTS.

of Neufchatel in Switzerland; communicated in a Letter to Dr. Mortimer Secr.

R. S. p. 47.

XV. *A State of the English Weights and Measures of Capacity, as they appear from the Laws as well ancient as modern; with some Considerations thereon; being an Attempt to prove that the present Avoirdupois Weight is the legal and ancient Standard for the Weights and Measures of this Kingdom; by Samuel Reynardson Esq;*
F. R. S. p. 54.

XVI. *A Letter from Dr. le Cat F. R. S. to C. Mortimer M. D. Secret. R. S. concerning the Cure of Dry Gangrenes; together with a Description of a new-invented Instrument for the Extirpation of Tumours out of the Reach of the Surgeon's Fingers.*
p. 72.

I. *A Letter from the Rev. Henry Miles D. D. & F. R. S. to Martin Folkes Esq; Pr. R. S. concerning Thermometers, and some Observations of the Weather.*

S I R,

Read Jan. 12.
1748.

THE Candor with which you receive whatever is presented to you, tending to advance Natural Knowledge, invites me to offer this Paper to your Hands, on the Subject of the Thermometer.

It has been often complained of, that the Theories we have of the Air and Weather, are so imperfect, and that an unfinished one, of the honourable Mr. *Boyle*, published since his Death, should be the best we yet have; perhaps there is equal Reason for Complaint, that the Thermometer first introduced into Use in *England* by the same excellent Philosopher, should be so little improved for more than half a Century of Years, and be made to serve a not much better Purpose than that of Amusement.

For some Years past, several eminent Philosophers at home and abroad have applied themselves to bring this Instrument to greater Perfection, and to render it more useful; and among them the great Sir *Isaac Newton* did not think it unworthy his Attention.

It seems now to be pretty generally agreed, that Thermometers made with Quicksilver are preferable

to all others ; that *extravagant Fluid*, as Mr. *Boyle* calls it, being most easily susceptible both of Heat and Cold, and, when well purified, not liable to be obstructed in its Motion.

I had, by some Years Experience, found both the Excellence of them, and the Necessity of keeping them in the open shaded Air, before I met with the learned and curious Essays Medical and Philosophical of Dr. *George Martine*, in which he so much recommends their Use ; and it was no small Satisfaction to me, to find that Gentleman had proved, by Experiments, that Quicksilver both heats and cools faster than any Liquor we know, faster, I am sure (says he), than Water, Oil, or even Spirit of Wine, and never freezes, by any Degree of Cold hitherto observed.

Might I be indulged the Liberty, I would embrace this Opportunity of inviting such Gentlemen, as attend to this Branch of Natural Philosophy, to consider what Dr. *Martine* has said to recommend the Use of Thermometers made with Quicksilver, and to place them in the open Air, guarded from the Sun's Rays ; which, some Observations I made, and did myself the Honour to lay before the *Royal Society* formerly *, may serve to shew the Necessity of ; especially a more remarkable one, lately made, which I shall subjoin hereto.

There is another Particular of great Importance, which I fear we may rather wish than hope to see made a general Practice, recommended by the same Gentleman ; that is, the constructing all Thermometers with one Scale But if this may not be expected, certainly

* See *Phil. Trans.* N°. 484, p. 613.

certainly no Thermometer should be made without adjusting two determinate and sufficiently distant Points of Heat and Cold; such, for instance, as those of boiling Water, and of Water just beginning to freeze, and the intervening Space divided into a convenient Number of equal Degrees. By this means we should be able to know what is meant by any specified Degrees of Heat or Cold, and a Comparison might be easily made of the State of the Air in distant Places, provided the Instruments were accurately made.

Dr. *Martine* seems to think, that the Degree of Cold which causeth Water to begin to freeze, is nearly equal in all Places, whatever little Variation there may be found in that Degree of Heat which causeth Water to boil, at different times, from the different Weight of the Atmosphere: So that we may look upon these two Points as sufficiently determinate.

An Account of an Observation I made of the sudden Change of the Temperature of the Air on Tuesday the 22d of November last, with the State of the Barometer, and other Circumstances.

On *Monday* the 21st in the Evening the Sky very clear, the Wind N. and a smart Frost, the Barometer was 30 Inches $\frac{2}{10}$ $\frac{0}{100}$. At near 9^h the Thermometer without my Window at 7^{gr}. below 0, or freezing Point. The Thermometer within, of the same Construction with it, and not a Yard from it,

the Room having had no Fire in it this Season) at 5gr. nearly above 0.

On *Tuesday* Morning, at 4^h 20', when I got up, I found the Barometer at 30. $\frac{2}{10}$ $\frac{6}{100}$ Inch; the Thermometer without at 14gr. $\frac{1}{2}$ below 0; that within at 2gr. $\frac{1}{2}$ above 0. I was much surpris'd hereat, and before I had finish'd my Entry I return'd to renew my Observation, fearing I might have made a Mistake, but found I had not: At 7^h 40' the same Morning, upon opening my Study-Window, I observ'd the Sky to look red and lowering; this induced me to go up to examine my Glasses, suspecting there might be a Change, and found the Barometer fallen to 30. $\frac{2}{10}$ $\frac{2}{100}$, the Thermometer without ris'n to 5gr. below freezing Point, but that within fallen to 1gr. above; the Wind getting about to W. and S. W. and before 10 in the Morning we had some Rain, and this severe Frost went off. At this last-mention'd Hour the Thermometer without had ris'n to 5gr. above 0; that within continuing at 1gr. as before. At 8^h $\frac{1}{2}$ that Evening the Thermometer without was at no less than 12gr. above 0, that within at 3gr. above 0: So that from that time I made my Observation at 4^h 20' in the Morning to 8^h $\frac{1}{2}$ at Night, there was a Change in the Temperature of the Air abroad of 26gr. $\frac{1}{2}$; while the Change within-doors did not amount to more than 1gr. warmer.

I will trespass no further on your Goodness, than (after have made this one Remark, that it seems probable from hence, that we may have frequently had greater Extremes of Heat and Cold by far, than have

have fallen under Observation) to beg Leave to subscribe myself, with the highest Esteem,

S I R,

Tooting, Dec. 6:

1748.

Your and the Royal Society's

most obedient, and

most humble Servant;

Henry Miles.

II. *An Account of the Case of a Clergyman's Lady, at Cottered near Baldock in Hertfordshire, who had a Stone under her Tongue, by Wm. Freeman Esq; F. R. S.*

Read Jan. 19.
1748.

THIS Substance, seemingly a Concretion of Stone or Chalk*, was voided in July 1748: from under the Root of her Tongue, just on the left Side of the middle String among the Blood-vessels. It was lodged in a Cell formed by itself, the Traces being left behind exactly tallying. It was voided without Pain, or Effusion of Blood.

The Patient began to feel in the Part affected some Uneasiness about 18. Months before the Discharge. The Pain extended itself sometimes along the Jaw almost to the Ear; the Glands being at times swell'd, and a salt Rheum flowing into the Mouth. The Swelling of the Part gradually increased to about the
Size

* The Stone is in the Museum of the Royal Society.

Size of a large Nutmeg; and, being felt by the Finger, was hard.

About a Fortnight before the Discharge, some white Specks appeared; upon which it was supposed that Matter was gathering; and being still hard, a common Poultrice of white Bread and Milk was applied, and then it presently dislodged itself, without any Application, and left the Patient ever since free from Complaint.

I was obliged to the Rev. Mr. *Chauncy*, the Husband of the Patient, for this Account.

III. *An Account of Glasses of a new Contrivance, for preserving Pieces of Anatomy or Natural History in spirituous Liquors, by Claud. Nic. le Cat. M. D. F. R. S. Royal Demonstrator in Anatomy and Surgery at Roan.*

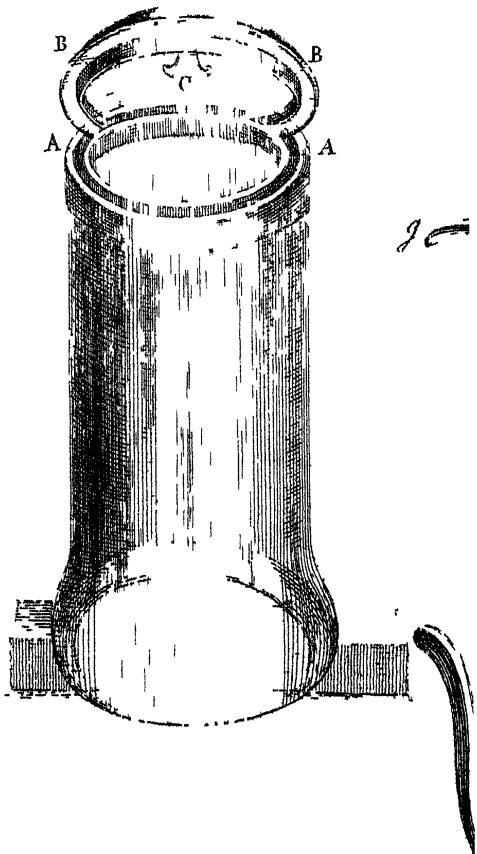
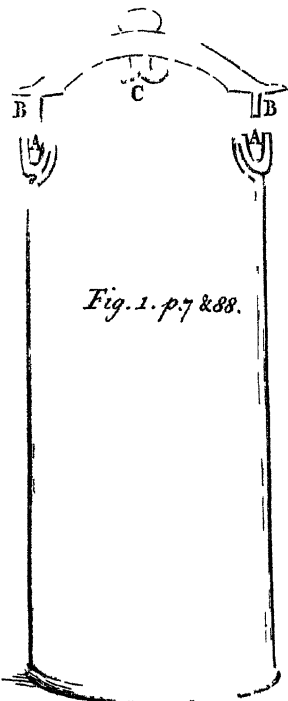
Translated from the French by T. S. M. D. F. R. S.

Read Jan. 19. 1748.

THOSE who have Collections of Anatomy, or Natural History, and preserve Animals, Vegetables, or any of their Parts, in spirituous Liquors, are sensible how expensive it is to supply the Waste of these Spirits, which evaporate considerably.

Having in 1739. begun to make a Collection of this sort, it was not long before I felt the Necessity I was under of contriving some kind of Vessel, or some way of closing the common Glasses, which might prevent, or at least diminish the Quantity of, this Evaporation. After

Fig 2 p 7



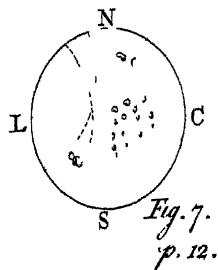
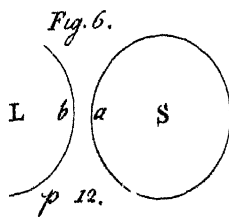
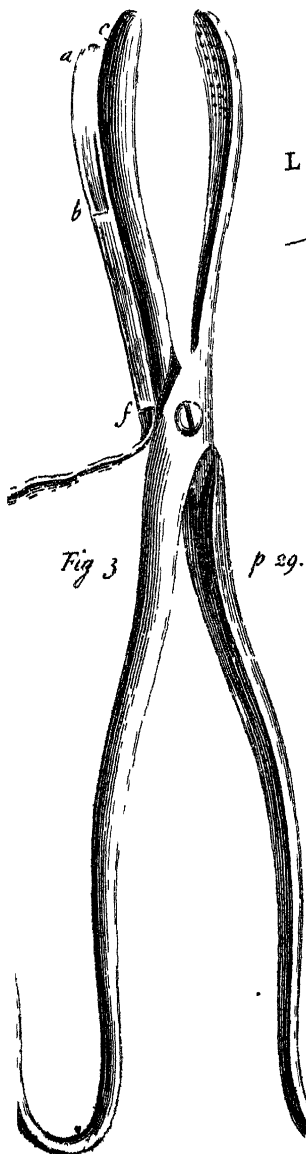


Fig 4
p. 29.

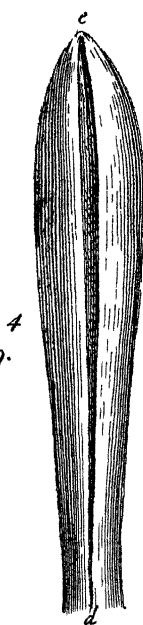
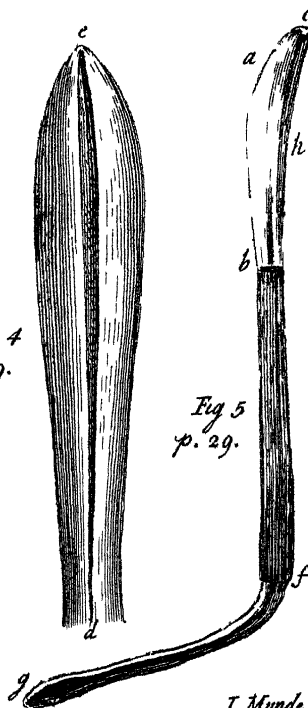


Fig 5
p. 29.



J. Mynde sc.

After trying several Methods, which did not fully satisfy me, I fixed upon the Glafs, which is represented in the annexed Figures, TAB. I. *Fig. 1.* and 2.

Its Difference from the common ones consists in having, quite round the Edge of its Orifice, a circular Groove or Chanel, *Fig. 2. AA*, an Inch deep for the smaller Sizes, and two Inches for the larger. This circular Groove is intended to receive a Border, *BB*, of the same Figure on the Cover *C*: In the middle of the Concavity of this Cover is a double Hook, on which the Threads are to be fastened, which suspend the Piece or Preparation that is to be put into the Glafs.

In putting the Piece into the Glafs, which contains the preserving Liquor, Care must be taken to place it on the Hooks in the same Position, which you intend it should keep in the Glafs: That done, you are to pour Oil, or Quicksilver, which is better, into the circular Groove *AA*, so as to make it about half-full. Then you are to let down the Piece into the preserving Liquor; and when it is intirely sunk down, the Cover *C* ought to light upon the Glafs, and its circular Border *BB*, enter into the circular Groove *AA*, where it falls into the Oil or Quicksilver, which rises up and fills the whole Groove; by which means the Glafs is in some measure hermetically sealed. The Oil indeed permits some small Evaporation; the Quicksilver more completely answers the End of this Invention, but it is more expensive,

As I had contrived this Glafs for my own private Use, I neglected making it public; till, happening to be present at the public Meeting of the *Academy*
of

of *Sciences of Paris*, at *Easter* 1746, I heard Mr. *de Reaumur* read a Memoir on this Subject. My Glafs seem'd to me vastly preferable to the Vessels propos'd by that great Academician. This Incident roused my Emulation, and gave me the better Opinion of my Glafs, a Pattern of which I sent to M. *Morand*. The same Motive engages me to take the Advantage of the Freedom of Correspondence re-established between *France* and *England*, in sending this Description to the *Royal Society*.

IV. Observationes aliquæ *astronomicæ* à Reverendo P. P. *Suarez* è S. J. in *Paraquaria* habitæ, et per D. *Suarez* M. D. cum Soc. *Regali* communicatæ.

Presented Jan. 19.
1748-9.

ANN!O 1747, *Februarii* 24, post meridiem, nubilo coelo toto fere tempore eclipsis Lunæ, hæc tantum observari potuerunt in missionibus *Paraquariæ Soc. Jes. à P. Bonaventura Suarez*, ejusdem Soc. missionario, in oppido *Sancti Angeli Custodis*, post emersionem secundi digiti Lunæ ex umbra Terræ, telescopia ped. 10½.

Aristarchus emergit	14 31 47
Tycho emergit	14 37 30
Calippus emergit	14 56 47
Dionysius emergit	15 0 4
Mare Cris. incipit emergere	15 13 17
Finis Eclipsis	15 16 4
	Intercapedinem

Intercapedinem marginum occidentalium Lunæ, et *Maris Crisii* vix capiebat diameter minor maculæ *Platonis*.

Oppidum *Sancti Angeli* in missionibus *Paraguarie* Soc. *Jesu* est reliquis orientalius. Ejus longitudo ab insula *Ferri* est gr. 323. m. 30. et latitudo gr. 28. m. 17 *Aust.*

Eclipsis Lunæ ab eodem observata in oppido *Sanctæ Mariæ Majoris*, eodem anno 1747. *Augusti* 19. horis p. m.

Penumbra sensibilis erat hor. 14. 44'.

Immersio Lunæ et macularum in umbram.

	h.	'	"
Initium	14	55	44
Aristarchus	15	0	13
Galilæus	15	0	41
Mare humor. incip.	15	4	14
Ang. infer. terræ pruinæ	15	5	29
Copernicus, &c.	15	9	26
Mare humor. totum	15	9	26
Plato, et Tycho æquidistabant a cent.			
umbræ	15	13	44
Idem	15	17	2
Plato et Tycho simul in margine umbræ	15	20	25
Digiti 6 obscurati	15	24	6
Menelaus	15	27	28
Dionysius	15	29	35
Lacus Somniorum	15	36	10
Maris Crisii Initium	15	43	41
Medium	15	46	26
	B		Finis

			"	"
Finis	.	.	.	15 49 16
Totalis obscuratio Lunæ	.	.	.	15 53 16

Emerfio Lunæ ex umbra.

			"	"
Initium emerfionis	.	.	.	17 34 48
Grimaldus	.	.	.	17 36 52
Aristarchus	.	.	.	17 40 0
Plato	.	.	.	17 53 34
Tycho	.	.	.	18 0 23
Digiti 6 obfcurati	.	.	.	18 3 30

Luna prope occafum vaporibus horizontis tremula non amplius fuit obfervata.

Toto tempore eclipsis Lunæ fuit coelum valde ferenum.

Longitudo *S. Mariæ Maj.* ab infula *Ferri* gr. 322, m. 40.

Latitudo gr. 27, m. 51. Auftr.

V. Obfervatio *Eclipsis folaris* Julii 14, et
Lunæ Julii 28, 1748. *Madriti* habitæ
à Domino *Antonio de Ulloa* S. S. R:

Prefd. Jan. 26. 1748-9. CUM ad faciendam hujus eclipsis ob-
fervationem paratum quidem effet
telescopium reflexionis duos circiter pedes oblon-
gum; cumque fatis notus haberetur motus pen-
duli cujusdam aftronomici, quo in mea ad *Peruvi-*
ana regna migratione ad plurimas ibidem una cum
D. *Georgio Joanne* peractas obfervationes ufus fueram,
ánimadverti

animadverti initium eclipsis in tempore
vero accidisse sub horam .

8 49 6

Macula *ab* (TAB. I. *Fig. 7.*) in disco solis
notata inter ipsius orientalem australem-
que partes, quæque optime tunc potuit
discerni, quod nulla alia esset ei proxima,
coepit sub Lunam immergi hora .

10 13 44 $\frac{1}{2}$

Totalis hujus maculæ immerfio .

14 46 $\frac{1}{2}$

Minime licuit nec emerfionem hujus maculæ, nec
totius eclipsis, finem observare, qui cum sol in
sua majori reperiretur supra horizontem altitudine,
deerat telescopio, commoditas necessaria ad illud
perficiendum. Similiter nec potuit prolixus digito-
rum numerus, ut oportet, haberi; cum dispositio
ipforum inquirendorum causa facta minime desiderio
aut exactitudini debitæ satisfecerit. Antequam con-
tactus visualis fieret limborum duorum planetarum
45'', aut ferme limbus Lunæ sese distinctum ope te-
lescopii obtulit percipiendum; idque abs dubio, quod
interceptare radios lucis ex illa parte incepisset;
ideoque quo magis cæteræ ipsius disci lunaris partes
a solis distabant, eo plus confusæ cernebantur.

Sub eclipsis initium visa est pars disci lunaris inter-
positi quasi coloris cujusdam in rubrum declinantis,
qui postmodum excrevit prout eclipsis majus habuit
incrementum.

Dies equidem extitit ferenus, et atmosfera nubi-
bus omnino libera, sicque in vespere sine mutatione
permanfit. Cum eclipsis medium subesset, aliqua di-
minutio lucis apparuit; notatumque est, ipsius reflexio-
nem aliquantulum debiliorem fuisse redditam; ærem-

que aliquid caloris tempori respondentis sensibilibiter amisisse; quæ mutatio post semihoram ab incepta eclipsi initium assumens usque ad illius exitum permansit; postquam iterum calor ut antea rediit.

Vide TAB. I.

Fig. 6. *S*, Sol, *L*, Luna, *a*, limbus solis, a quo incepit immersio; *b*, limbus lunæ, qui sese ante eclipsin obtulit percipiendum.

Fig. 7. *NOSL*, discus solaris; *L*, oriens; *O*, occidens; *N*, pars borealis ejusdem disci; *S*, pars australis; *ab*, macula in solare disco observata; *c*, alia in eodem disco inter septentrionem, et ortum, ad quam minime pertigit eclipsis; *d*, aliæ quam plurimæ maculæ in medio disci solaris.

Observatio Eclipsis partialis Lunæ sub diem 8 Aug.
28 Julii
1748. Matriti, a *D.* Antonio de Ulloa *navis bellici a Rege Cath. præfecto una cum excellentissimo Duce Afidonienti, naturalium disciplinarum et omnigenæ eruditionis viro.*

Eodem quidem telescopio, quo observata fuit præcedens solis eclipsis, usus sum ad id peragendum in defectu Lunæ, qui accidit die 8 *Augusti* anni 1748. ipsiusque phasés annotandas quæ ad tempus verum reductæ ita se habent.

Penumbra quidem percipi incepit sub	h	′	″
horam noctis	.	.	.
Initium eclipsis mihi visum est, etsi non	09	45	42
sine aliquo dubio, accidisse	.	.	.
	50	0	
		Imm.	

Imm. Capuani	0	13
Principium immersionis Maris Humorum	4	10
Tycho umbram ingredi incipit	11	54
Totalis immersio Tychonis	14	14
Initium immersionis Grimoaldi	15	15
Omnimoda immersio Maris Humorum	15	18
Omnimoda immersio Grimoaldi	20	51
Reinoldus umbram subiit	28	40
Snelius et Furnerius eandem attingunt	44	40
Snelius et Furnerius sub umbra	47	40
Fracastorius immergi incipit	49	0
Grimoaldi emergentis initium	51	16
Mare Nectaris immergi incipit	52	20
Grimoaldus totus emergit	56	32
Initium immersionis Maris Fœcunditatis	11	13 58
Mare humorum incipit ab umbra liberari	19	11
Mare humorum totum extra umbram	30	18
Totalis emerſio Maris Nubium	40	24
Totalis emerſio Maris Nectaris	45	16
Tycho incipit ab umbra emergi	47	35
Totalis emerſio Tychonis	49	54
Umræ finis in disco lunari	12	10 22
Penumbra fortioris finis	17	25
Penumbra qualisqualis finis	22	12

Eclipsis initium dubium extitit, quod umbra et penumbra non bene discernerentur; ideoque de eo difficulter judicari potuit, etiam si ad observationem peragendam satis commoda, et ab impedimentis libera permanisset atmosphæra.

Antonius de Ullœa.

VI. *Remarks on the principal Paintings found in the subterraneous City of Herculaneum, and at present in the Possession of the King of Naples; by ——— Blondeau Esq; communicated by Tho. Stack M. D. & F. R. S.*

Read Jan. 26. 1748-9. **T**HE Paintings found under-ground in

Herculaneum near *Portici*, are all done on *Stucco* in Water-colours in *Fresco*. They have been taken from the Walls of an Amphitheatre, a Temple, and Houses, and are in great Variety, some exceeding fine, and well preserved. I divide them into two Classes; the first of which contains the four following Pictures.

The first is a large Piece of 7 Feet by 5, representing *Theseus*, after having killed the *Minotaur*. He is naked at full Length, holding a Club or knotted Stick in his left Hand by the small End: A young Woman by his Side, holding the said Club a little higher with her right Hand, and looking up wishfully at him: Three Children of different Ages; one kissing his right Arm, which is extended; the second his left Leg, which is a little rais'd; and the third grasping and kissing his left Arm; all as it were wishing him Joy, and caressing him after the Victory; the *Minotaur* lying on his Back dead at his Feet, a human Body with a Bull's Head and short Horns. This Piece has been a great deal larger. On the upper Part is Part of a naked Arm with a Trumpet.

The second is a noble Piece of 10 Feet by 7, intire, and seems to represent *Rome* triumphant;

viz. A grand Figure of a Woman sitting, with a Garland of Flowers on her Head, a majestic commanding Countenance, a knotted Club, exactly like that of *Theseus*, long and tapering, in her left Hand, resting herself on her right Elbow, with her Hand to her Temple: A young Fawn laughing over her Shoulder, with a musical Instrument of twelve Pipes in his Hand. At her Side is a Basket of Fruit: Over-against her a naked Figure of a Man, robust and vigorous, with a Beard; his Back short, and, to Sight, his Face turned to the left Shoulder; a Garland of Flowers or Laurels on his Head; a Quiver, a Bow and Arrows by his Side; under his left Arm something like Part of a Lion's Skin, and one Paw, but faintly expressed: A fine natural Attitude; most exquisite Proportion and Drawing. A little higher, close by him, a Genius or Goddess of Fame, with Wings, a Garland on her Head, a Sprig like Ears of Corn in the left Hand, and pointing with the right; and both she and the Man looking to a young Infant below (a most beautiful Figure, and natural Attitude) sucking a Doe, finely drawn and spotted, which is licking the Child's Knee. Under their Feet an Eagle with his Claw upon a Globe, and a Lion, both as large as Life. Some reckon the Man *Hercules*, and the Woman *Pomona*: But *Hercules*, I think, did not use the Quiver; and *Pomona* has no such Majesty, nor any Business with a Club, which is longer and smaller than that of *Hercules*.

The third is a Piece of four Feet square, representing the Centaur *Chiron*, sitting, as it were, on his Backside, and teaching his Pupil *Achilles*, a young Lad of about twelve, to play upon the Harp. Part of the Horse is a very difficult forced Attitude; the whole

whole Body being in View ; left fore Foot extended ; great Expression and Attention both in *Achilles* and *Chiron*, who is putting his right Hand round the Boy, and playing, by the Help of a small Instrument, on the Strings, which are ten in Number. This is accounted a most masterly Piece as ever was seen. *Chiron* has a Mantle tied round his Neck, made of the Skin of some Animal ; and *Achilles* stands upright naked.

The fourth is a Piece of 5 Feet by 4, representing some very solemn and melancholy Story of the *Romans*, and contains seven Figures, three Men and four Women. Perhaps the Story of *Virginia*, when *Appius Claudius* wanted to accuse her falsely, in order to gratify his Lust. One Man sitting in a pensive Mood, his left Elbow on his Knee, and his Hand up to his Forehead : Another sitting over-against him, setting forth something in a Paper, which he holds to the Breast of the first : A young Woman sitting on the right Side of the first, a Figure expressing great Concern ; her left Hand affectionately about his Shoulder : And another young Woman standing with great Attention and Surprise by her : Behind both, the Figure of a Woman larger than the rest, with a Quiver appearing above her Shoulder, as *Diana* : An elderly Woman in a suppliant bending Posture, with her Finger at her Chin, as if she were listening with great Grief, and her Face to the first Figure. Also an old Man, in much the same Attitude, in great Grief, as if weeping. Perhaps the Family of *Virginia* listening to the Accusation against her, and fearful lest she should be delivered over to the brutal Lust of the Consul : To avoid which, when no other Remedy was left, *Virginus* desired to speak with his Daughter in private, and killed her.

These

These are the four capital Pieces; and they are so extremely well executed, that Don *Francesco de la Vega*, a Painter, whom the King of *Naples* sent for from *Rome*, as one of the best Hands, to take Draughts of these Paintings, told me, that if *Raphael* were now alive, he would be glad to study the Drawings, and perhaps take Lessons from them. Nothing can be more just and correct: The Muscles are most exactly and softly mark'd, every one in its own Place, without any of that preternatural Swelling, which is so much over-done in some of the best *Italian* Masters, that all their Men are made to appear like *Hercules*. It is surprizing how fresh all the Colours of these Pictures are, considering that they have been under-ground above 1650 Years; besides the Years they stood, before they were covered by the Eruption, which cannot be exactly determined.

Theseus in the first, and the naked Figures in the second Piece, are a good deal upon the red Colour; but the Women and Children are of as soft and mellow flesh Colours as if painted in Oil. The third and fourth are so highly finish'd, that you can scarcely discern whether they are done in Water or Oil-colours. The last pleased me most; the Composition is good; the Attitudes natural, and of fine Kinds; the different Characters justly express'd; the Drawing and Drapery exquisite; and, tho' done in Water, with only two or three Colours at most; yet the Light and Shade are so artfully managed, that the Figures are quite out of the Surface. The Connoisseurs prefer the third, or the Centaur.

We now come to those of the second Class, which are as follows.

1. A Piece of 4 Feet by 3, supposed to be the Judgment of *Paris*. Three Goddesses, with Rays like Circles of Glory about their Heads, which are very fine: The first sitting inclined; two standing naked; good Drawing, and natural Attitudes. A Figure of a Shepherd at a Distance above them, with a crooked Staff in his Hand, a Garland on his Head, his right Hand grasping something, which is not distinctly seen, as not being so much finish'd as the rest.

2. A Piece of four Feet square, representing *Hercules*, when a Child, tearing the Serpent in Pieces with great Vigour and Fierceness in his Eyes: An old Man drawing a Dagger, being startled at the Danger, in order to kill the Snake: A Woman design'd holding up her Hands to Heaven: An old Woman holding a Child in her Arms. The Whole natural and well drawn.

3. A Piece of 4 Feet by 3: An old Man naked, sitting: A naked Boy standing by his Side, with a Piece of a Rod or Twig in each Hand: The old Man is pointing with his Finger, and teaching the Boy something. Fine Drawing, somewhat defaced.

4. A Piece of 6 Feet by 3: A Half Length of *Jove* with Thunder in his Hand: A little *Cupid* looking over his Shoulder: A Rainbow: An Eagle: A bold old Head: A Figure like *Venus* coming from bathing, naked down to the Thighs. Beautiful Colour, great Softness, and fine flesh Colours; seems to have the privy Parts of a Man, an Hermaphrodite.

5. A small Piece, about fourteen Inches square: Two fine Female Heads, or Half-Lengths; one with a Book in her Hand; great Expression! Two *Muses*.

6. A

6. A Piece of about eighteen Inches square; two Figures of Women like Graces; one naked to the Middle, sitting; something like a Quiver at her Feet; another in a Robe, standing, and leaning on her Elbow: Good Attitude; Drawing and Drapery very fine; Colours taint.

7. and 8. Two Pieces, of three Feet square, of *Egyptian* Sacrifices. First, The worshipping of an Idol, which is placed above in the Portico of a Temple, and appears bloody: Seven Figures bending and suppliant in the Act of Adoration: An Altar in the middle: Two Birds, Storks, standing one on each Side: Many other Figures faint. — Second, a Priest sacrificing upon a flaming Altar: A Row of different Figures on each Side: Two in the middle in the Act of Preaching. Attitudes very just and natural, finely done, great Solemnity or Horror: When look'd at near, seems more daubing and unfinished: By *Virtuosi* esteemed a great Piece of Antiquity, and of great Study.

9. Is a Half-Length of a Man like a Priest, with a small Water-pot, pouring it into a Basin, seen by the Light of a Lamp.

10. Is *Orpheus* and *Venus* lying together, kissing and caressing, chain'd by the Legs: A Servant holding a Harp. Finely designed, but defaced.

11. An old Man sitting, with a Cup in one Hand, a Stick and Garland in the other,

12. Is a Half-Length of a young Woman.

13. Is a Piece of two and a half by two Feet: Old *Silenus* holding in his Arms *Bacchus*, a Child: A Satyr: A *Baccante*: *Mercury* sitting below: A

Tyger and Als lying. Finely drawn, and naturally express'd.

14. A sleeping Nymph; a Satyr lifting up her Robe: Three By-standers, who seem to be very curious. A small Piece.

15 and 16. Two small Pieces of Satyrs ravishing Nymphs: Well drawn, and natural Attitudes, but faint and defaced.

17. A Piece of four Feet and a half by one Foot and a half: A Figure of a *Roman* Lady, almost full Length, in Attitude of great Grief; her Head a little inclin'd; her Arms dropp'd down, and her Fingers clasped; a Sword, with the Handle leaning in the Hollow of her Hand. Very just and natural Expression, well finished.

18. The Goddess *Flora* as descending from Heaven. Fine Contours: About two Feet square.

19. Is a Piece three Feet square: A naked Figure with a Lance like a General: A Woman sitting: A young Man holding his Horse: An old Woman. Finely done, but defaced.

20. *Orpheus* with his Harp, sitting on a Rock by the Sea Side: A Child or Sea-God riding on a Dolphin, presenting him with a Book.

21. Ten small Pieces of *Roman* Ceremonies with many Figures; some eating, dancing, making Love; others tied like Prisoners.

22. Eight small *Cupids* in different Attitudes, and different Paces. Very good.

23. A Pheasant and other Birds: Two small Baskets, one tumbled down: A Rabbit eating. Exquisitely done.

24. Two naked Figures, with *Cupid* betwixt.

25. A Figure in the Attitude of a Warrior, with a Sword in his right Hand, a Buckler in his left, and a Cup with some Jewels at his Feet.

26. A large Piece of Architecture, which, look'd at near, seems rough and daubing, at a Distance very good Perspective. You see quite thro' two Portico's, one above another, into a Palace or Church. Very curious Architecture, Colours very lively and fresh.

27. A Landscape with Houses, Ruins, a Theatre. Good Architecture: Figures of Pheasants, Mules loaded, &c.

28. Another Piece of Architecture and Perspective, very good.

A great many other Figures of Men and Women, not easy to be described, because pretty much defaced: Also many Fancies of Birds, Beasts, Chariots drawn by different Animals, Children driving: All in small.

Little Pieces of Landscapes, and other Ornaments for the Walls of their Houses, which were painted mostly of a yellowish Colour; divided into Squares or Panels; with those Pieces of Painting in the Panel, and a Border round it. There is a very good Piece of Ornament or Cornice, that was upon the Picture of *Theseus*, of a very good Taste, and finely finished.

See Accounts of this subterraneous City in these *Transf.* No. 456, p. 365. No. 458, p. 484, 489, 493.

VII. *An Account of a new invented arithmetical Instrument called a Shwan-pan, or Chinese Accompt-Table ; by Gamalief Smethurst.*

Read Jan. 29. 1748. **T**HE *Chinese* have for many Ages picqu'd themselves on being the most wise of any Nation in the World ; but late Experience and cloſer Converſe with them hath found this Pride to be ill-grounded. One Particular, in which they think they excel all Mankind, is, their Manner of accompting, which they do with an Instrument composed of a Number of Wires with Beads upon them, which they move backwards and forwards. This Instrument they call a *Shwan-pan*.

Now I truſt I have form'd one on the Plan of our 9 Digits, that in no caſe falls ſhort of the *Chinese Shwan pan*, but in many excels theirs.

The *Chinese*, according to the Accounts of Travellers, are ſo happy as to have their Parts of an Integer in their Coins, &c. decimated, ſo can multiply or divide their Integers and Parts as if they were only Integers. This gives them the Advantage over *Europeans* in reckoning their Money, &c. But then, as they have no particular Place ſet apart for the leſſer Denominations of Coins, Weights, Meaſures, &c. their Instrument can't be uſed in *Europe*, nor can it be ſo univerſally applied to Arithmetic as mine, for I have provided for the different Diviſions of an Integer into Parts.

This

This Instrument hath the Advantage of our Digits in a great many Cases. First, the Figures can be used so may be used by a blind Man. If it had no other, this alone would be sufficient to gain it the Attention of Mankind.

Another Advantage from it is, that, when attained this Method is much swifter than by our Digits, and less liable to Mistakes: It is likewise not so burdensome to the Memory in working the Rules of Arithmetic, as by our Digits, we being oblig'd to carry the Tens in the Mind from one Place to another, which are set down by the *Shwan pan*. — One may work a whole Night, without confusing the Head, or affecting the Eyes in the least.

It may be of great Use to teach People the Power of Numbers, likewise to examine Accompts by; for, as the Person will, by the *Shwan pan*, work it a quite different Way, it will serve as if another Person had gone thro' the Accompt; if it proves right with the written one, they may rest assured the Work is true.

It may be a very pretty Lure to lead young People to apply their Minds to Numbers.

The Inventor produced one of these Instruments before the *Society*, and work'd several Questions in Arithmetic upon it. It much resembles the *Abacus* of the Ancients.

C. M.

VIII. *Extract of a Letter from Benj. Heath Esq; to Peter Davall Esq; Secr. R. S. inclosing a Proposal for intirely removing the only real Defect in the lateral Operation for the Stone; by Mr. John Mudge Surgeon at Plymouth.*

Dear Sir,

Read Feb. 2. *** I TAKE the Freedom of conveying to you a Memoir written by a very ingenious young Surgeon of my Acquaintance proposing an Improvement in the lateral Method of cutting for the Stone. His View in putting me on giving you this Trouble is, that it may be laid before the *Society*; and if it be thought to deserve it, it may be communicated to the Public in their *Transactions*. I am,

S I R,

*Exeter, Jan. 16.
1748.*

Your most humble Servant,

Benj. Heath.

A Proposal for intirely removing the only real Defect in the lateral Operation for the Stone.

THO' the lateral Method of cutting for the Stone is now almost universally allow'd to have greatly the Advantage of any other hitherto discover'd, yet it must be confess'd, that the Difficulty and

and Hazard attending the Extraction of large Stones this Way, has really robb'd it of its Title to Perfection; for tho' the Incision be made to the Wish, quite through the Prostate, and carried on to the Neck of the Bladder, if this be the Case (for it frequently happens to the contrary) as the Bladder itself in general is not, nor in all Probability can be, wounded in this Way of operating, the real Aperture after all for the Exit of a large Stone is so small, that the Parts must suffer most violent Lacerations, and a Train of consequent Evils.

The old Method indeed is greatly more obnoxious to this Misfortune, because the Parts are torn to Pieces by downright Violence, without any previous Incision of any Consequence to prepare them for the Egress of the Stone; and this Imperfection in the Operation is so notoriously apparent, and so destructive in fact, that this Method is deservedly in Disesteem, and almost universally discarded.

I wish it could be said, that the lateral Method was intirely free from this Imperfection; but I fear an impartial Inquiry will make it clear, that three Fourths of the Accidents which have attended this Operation, may in truth be attributed to excessive Distensions and Lacerations of the Bladder, those few Cases, which have miscarried from (what may have been supposed) a mere symptomatic Fever, will, I believe on a strict Disquisition, afford a shrewd Suspicion, that this very Fever itself arose from some Violence offer'd to the Bladder, in the forcible Extraction of the Stone.

I will not enter into a strict Examination of those fatal Symptoms which sometimes succeed the Operation in grown Subjects, in order to prove that they

in general proceed from the Bladder's being too roughly dealt with, because I take the Case to be of itself very evident : Unless the Habit is remarkably bad, to what else shall we attribute violent Pain, and the successive Inflammation, Tumour, Suppression of Urine, Mortification, &c.? These surely are not the Attendants on a simple Incision only ; for constant Experience evinces, that the Bladder, tho' an Organ of great Importance, and essentially necessary to the animal Oeconomy, may be wounded with as little Danger of any of the above-mention'd Evils, as any other membranous Part.

But I believe we shall not be at a Loss for the true Cause of all those Mischiefs, if the State of the Parts in the Extraction of a large Stone be closely consider'd.

It may be observ'd, when a Stone is laid hold of by the *Forceps*, that both together, Stone and *Forceps*, from the Screw-pin to the former, form a complete Wedge ; insomuch that a Person in a forcible Extraction, can scarcely conceive the Power applied to the Bladder, or the Force with which it is distended. If the Diameter of the Stone be equal to a third Part of the Length of the Chops of the *Forceps*, a Force of ten Pounds applied to them will be to the Wound of the Bladder, equal to thirty ; but how shocking must be the Case, when (either on account of the Magnitude of the Stone, or Narrowness of the Wound) a Man uses his utmost Force, and many such Instances in adult Bodies I have seen. The Power is then augmented by the Action of the Lever to two or three hundred ; a Force no doubt sufficient to reduce the Bladder and neighbouring Parts to Rags.

This

This is scarce to be credited ; but there is too much Reason to believe, that the Want of Success in Subjects arriv'd at adult Age, where the Stones are almost always large, is owing intirely to this very Circumstance.

When all this Violence is insufficient, there is at present no other establish'd Method, than either to attempt the making a second Incision on the Stone, as it is held in the *Forceps*, or to withdraw the latter, and to make it on the Bladder, in the flaccid State it then lies, without any Guide at all.

As to the first Method, it is evident the *Forceps*, Stone, and Bladder in Men are so much in the dark, that the Incision must be made with the utmost Difficulty ; indeed it is hardly possible to cut at all with any Certainty.

The other Way of cutting on the Bladder when the *Forceps* is withdrawn is much worse ; for if it be remember'd, that the Bladder lieth upon, and is contiguous with the *Rectum*, and that they are both in the same flabby State, it will appear impossible to cut the one, without (at least a very great Risque of) wounding the other.

This manifest Defect in the Operation would be intirely removed, if there always was a Director for the Knife left in the Bladder ; and this is so easily and completely to be done, that its great Simplicity seems to be the Reason it has not been attended to. If one Limb of the *Forceps*, from the Joint to its Extremity, be converted into a Staff, by making a deep Groove through its whole Length, it will better answer the End desired, than if it were possible to suffer the Staff itself to remain in the Bladder

during the Operation; for, when a large Stone is laid hold of, and the *Forceps* of course much divaricated, infomuch that the Extraction of the Stone is found to be impracticable with Safety, without a second Incision on the Parts upon the Stretch; you then slide the Point of a narrow Knife on the Groove of the *Forceps* quite on into the Bladder, and it will divide the very Part which needs it most; whilst the *Rectum*, on account of its flaccid State, will most certainly escape wounding. If the Wound is desired to be but little larger, the *Forceps* must be but gently drawn forward when the Incision is made; but if, on the other hand, the Stone prove extremely large, the *Forceps* should be then drawn forwards with a Force sufficient to put the Bladder upon the Stretch; and by this Management the Dilatation may be made as great or little as is required.

As the common Knife is not so proper for this Purpose on account of its Breadth, I have got one made of a more convenient Form, with a Gorget-Handle and Button-Point, as in the *Bubonocèle* Knife.

This Method, as it removes all Occasion for Violence to the Bladder, will reduce the Effects of the Operation nearly to those of a mere Incision only, which might, as now, sometimes prove fistulous, but I believe scarcely ever mortal.

I would not be understood to mean that it should be used in common Cases, and moderate sized Stones; no; Mr. *Chefelden* has sufficiently demonstrated to the World, by Experiment, the Inconvenience of cutting beyond the Prostate, when it can be avoided. I only say this, that where a large Stone offers, and the Circumstances are such, that the Operator is under a Necessity of tearing the Parts to
Pieces,

Pieces, unless divided by an Incision, the latter is more safe and eligible.

The principal Advantages of this Contrivance are, 1. That the Degree of Dilatation is in the Operator's Power, to the greatest Exactness: 2. That it will infallibly divide those Parts only which are upon the Stretch; and for this Reason, 3. The *Rectum*, if it is empty, and consequently flaccid, must certainly escape wounding. Its great Simplicity is another Circumstance much in its Favour; for it seems allow'd on all Hands, the less an Operation is incumber'd with Instruments the better. In common Cases, where the Assistance of this Method is not wanted, the *Forceps* is not the least incommoded as to its general Use; but if the Stone prove large (which can never be certainly known till it is laid hold of), the Remedy is at hand.

Plimouth, Jan. 6.
1748-9.

John Mudge.

P. S.

These *Forceps* and Knife are represented in TAB.

I. *Fig. 3, 4, 5.*

Fig. 3. The *Forceps*, with the Knife, *ab*, applied to one of the Cheeks of it. *c*, the Button. *bfg*, the Handle.

Fig. 4. The Cheek of the *Forceps* with the Groove in it *de*.

Fig. 5. The Knife. The Blade *ab*; the Button *c*, made to fit, and slide along the Groove *de*; *bfg* the Handle; *cab* the sharp Edge; *chf* the Back of the Knife, which must have the same Curve as the Back of the Cheek of the *Forceps* or Groove to which it is to be applied, as in *Fig. 3.*

C. M.
IX.

IX. *An Account of the Locusts, which did vast Damage in Walachia, Moldavia, and Transilvania, in the Years 1747 and 1748; and of some Swarms of them, which, in the Months of July and August 1748. came into Hungary and Poland; by a Gentleman who lives in Transilvania.*

Read Feb. 2. 1748-9. **I**T is certain that the Locusts came into *Transilvania* from *Walachia* and *Moldavia*, and particularly thro' those narrow Openings in the Mountains, which are commonly called Passes; the most considerable of which, in the Neighbourhood of *Clausenburg*, is called the Pass of the *Red Tower*, and thro' others not far from *Karlstat*, which are common Roads from *Transilvania* into *Moldavia* and *Walachia*.

The first Swarms enter'd into *Transilvania* in *August 1747*: These were succeeded by others, which were so surprisngly numerous, that when they reached the *Red Tower*, they were full four Hours in their Passage over that Place; and they flew so close, that they made a sort of Noise in the Air, by the beating of their Wings against one another. The Width of the Swarm was some Hundreds of Fathoms, and its Height or Density may be easily imagined to be more considerable, inasmuch as they hid the Sun, and darkened the Sky, even to that degree, when they flew low, that People could not know one another at the Distance of twenty Paces.

But

But whereas they were to fly over a River that runs in the Vallies of the *Red Tower*, and could find neither Resting-place nor Food; being at length tired with their Flight, one Part of them lighted on the unripe Corn on this Side of the *Red Tower*, such as Millet, *Turkish* Wheat, &c. ; another Part pitch'd on a low Wood: Where having miserably wasted the Produce of the Land, they continued their Journey, as if a Signal had been actually given for a March. The Guards of the *Red Tower* attempted to stop their Irruption into *Transilvania* by firing at them; and indeed where the Balls and Shot swept thro' the Swarm, they gave way and divided; but, having fill'd up their Ranks in a Moment, they proceeded on their Journey.

They are of different Forms, according to their different Ages: For when, in the Month of *September*, some Troops of them were thrown to the Ground by great Rains, and other Inclemency of the Weather, and thoroughly soaked with Wet, they crept along in quest of Holes in the Earth, Dung, and Straw; where, being sheltered from the Rains, they laid a vast Number of Eggs, which stuck together by a viscid Juice, and were longer and smaller than what is commonly called an Ant's Egg, very like Grains of Oats. The Females, having laid their Eggs, die like the Silkworm; and we *Transilvanians* found by Experience, that that Swarm which enter'd into our Fields by the *Red Tower*, did not seem to intend remaining there, but were thrown to the Ground by the Force of the Wind, and there laid their Eggs; a vast Number of which being turn'd up, and crushed by the Plough,

in

in the Beginning of the ensuing Spring yielded a yellowish Juice.

In the Spring of 1748. certain little blackish Worms were seen lying in the Fields and among the Bushes, sticking together, and collected in Clusters, not unlike the Hillocks of Moles or Anrs. As no body knew what they were, so there was little or no Notice taken of them; and in *May* they were cover'd by the shooting of the Corn sown in the Winter. But the subsequent *June* discover'd what those Worms were; for then, as the Corn sown in the Spring was pretty high, these Creatures began to spread over the Fields, and become destructive to the Vegetables by their Numbers. Then at length the Country People, who had slighted the timely Warning given them, began to repent of their Negligence; for, as these Insects were now dispersed all over the Fields, they could not be extirpated without injuring the Corn.

At that time they differ little or nothing from our common Grasshoppers; having their Head, Sides, and Back of a dark Colour, with a yellow Belly, and the rest of a reddish Hue. About the middle of *June*, according as they were hatch'd sooner or later, they were generally a Finger's Length, or somewhat longer, but their Shape and Colour still continued.

Towards the End of *June* they cast off their outward Covering; and then it plainly appear'd that they had Wings, very like the Wings of Bees, but as yet unripe and unexpanded; and then their Body was very tender, and of a yellowish Green: Then, in order to render themselves fit for flying, they gradually unfolded their Wings with their hinder Feet,

Feet, as Flies do. And as soon as any of them found themselves able to use their Wings, they soared up, and, by flying round, the others provoked them to join them: And thus their Numbers increasing daily, they took circular Flights of twenty or thirty Yards wide, until they were join'd by the rest; and, after miserably laying waste their native Fields, they proceeded elsewhere in large Troops.

Wheresoever those Swarms happen'd to pitch, they spared no Sort of Vegetable; they eat up the young Corn, and the very Grass; but nothing was more dismal to behold than the Lands in which they were hatch'd; for they so greedily devoured every green thing thereon, before they could fly, that they left the Ground quite bare.

There is nothing to be fear'd in those Places to which this Plague did not reach before the Autumn; for the Locusts have not Strength to fly to any considerable Distance, but in the Months of *July*, *August*, and the Beginning of *September*; and even then, in changing their Places of Residence, they seem to tend to warmer Climates.

Different Methods are to be employed, according to the Age and State of these Insects; for some will be effectual as soon as they are hatch'd; others when they begin to crawl; and others, in fine, when they are able to fly. And Experience has taught us here in *Transilvania*, that it would have been of great Service, to have diligently sought out the Places where the Females lodged; for nothing was more easy, than carefully to visit those Places in *March* and *April*, and to destroy their Eggs or little Worms with Sticks or Briars; or if they were not, to be beat

out of the Bushes, Dunghills, or Heaps of Straw, to set fire to them ; and this Method would have been very speedy, convenient, and successful ; as it has been in other Places. But in the Summer, when they have march'd out of their Spring-Quarters, and have invaded the Corn-fields, &c. it is almost impossible to extirpate them, without thoroughly threshing the whole Pièce of Land that harbours them, with Sticks or Flails, and thus crushing the Locusts with the Produce of the Land.

Finally, when the Corn is ripe, or nearly so, we have found, to our great Loss, that there is no other Method of getting rid of them, or even of diminishing their Numbers, but to surround the Piece of Ground with a Multitude of People, who might fright them away with Bells, brass Vessels, and all other Sorts of Noise. But even this Method will not succeed, till the Sun is pretty high, so as to dry the Corn from the Dew ; for otherwise they will either stick to the Stalks, or lie hid under the Grass. But when they happen to be driven to a waste Piece of Ground, they are to be beat with Sticks or Briars ; and if they gather together in Heaps, Straw or Litter may be thrown over them, and set on fire. Now this Method serves rather to lessen their Numbers, than totally destroy them ; for many of them lurk under the Grass or thick Corn, and in the Fissures of the Ground from the Sun's Heat : Wherefore it is requisite to repeat this Operation several times, in order to diminish their Numbers, and consequently the Damage done by them. It will likewise be of Use, where a large Troop of them has pitch'd, to dig a long Trench, of an Ell in Width and Depth, and

and place several Persons along its Edges, provided with Brooms, and such-like things, while another numerous Set of People form a Semicircle, that takes in both Ends of the Trench, and encompasses the Locusts, and, by making the Noise above-mentioned, drive them into the Trench; out of which if they attempt to escape, those on the Edges are to sweep them back, and then crush them with their Brooms and Stakes, and bury them, by throwing in the Earth again.

But when they have begun to fly, there should be Horsemen upon the Watch in the Fields, who, upon any Appearance of the Swarm taking Wing, should immediately alarm the Neighbourhood by a certain Signal, that they might come and fright them from their Lands by all Sorts of Noise; and if, tired with flying, they happen to pitch on a waste Piece of Land, it will be very easy to kill them with Sticks and Brooms, in the Evening, or early in the Morning, while they are wet with the Dew; or any time of the Day in rainy Weather; for then they are not able to fly.

I have already taken notice, that, if the Weather be cold or wet in Autumn, they generally hide themselves in secret Places, where they lay their Eggs, and then die: Wherefore great Care should be taken at this time, when the Ground is freed of its Crop, to destroy them, before they lay their Eggs.

In this Month of *September* 1748. we received certain Intelligence, that several Swarms of Locusts came out of *Walachia* into *Transylvania* thro' the usual Inlets, and took Possession of a Tract of Land in the Neighbourhood of *Clausberg*, near three

Miles in Length; where it was not possible to save the Millet and *Turkish* Wheat from these Devourers.

I am of Opinion, that no Instances of this kind will occur in our History, except what some old Men remember, and what we have experienced; at least there is no Account, that any Locusts came hither, which did not die before they laid their Eggs; however, this is a known Fact, that, about forty Years ago, some Swarms came hither out of *Walachia*, and did vast Damage where-ever they settled; but either left this Country before the End of Summer, or died by the Inclemency of the Weather.

Perhaps better Remedies may be had from other Countries, where this Evil is more common, against next Spring; for the Winter Season is very safe from this Plague.

The Gentleman, to whom the foregoing Account was sent from *Transylvania* to *Vienna*, and who transmitted it hither, has also informed us, that a considerable Number of these Locusts had also come within twenty Leagues of that City; and that one Column of them had been seen there, which was about half an Hour's Journey in Breadth; but of such a Length, that, after three Hours, tho' they seemed to fly fast, one could not yet see the End of the Column. The Eggs of these Animals, which have been preserved in dry Mould, have produced nothing; but those that have been preserved in Mould that was moistened with Water from time to time, gave early in the Spring of 1749. some of these Grasshoppers. The little ones were, soon after they came forth, of the Size nearly of ordinary Flies: They had already the Form of Grasshoppers,
these

but they had as yet no Wings. This Observation shews, that the Author of the foregoing Account was mistaken, when he says, "These Insects had at first the Form of Grubs, or small Worms." They change their Skin several times, but they do not acquire Wings till they have changed for the last time. .

The Grasshoppers that were taken in *England* in 1748. have been compared with those that have been sent over from *Hungary* and from *Poland* that same Year, and they have been found to be perfectly of the same kind. There are in Sir *Hans Sloane's* Collection * some of the same sort of Locusts or Grasshoppers, preserved in Spirits of Wine, and which were taken up here above thirty Years since, and are exactly like those from *Egypt* and *Barbary*.

X. *A Letter from Mr. Henry Baker F.R.S. to the President, concerning some Vertebrae of Ammonitæ, or Cornua Ammonis; communicated to Mr. Baker by the Rev. Dr. Miles F.R. S.* _

S I R,

Read Feb. 9. 1748-9. I HAVE now the Honour to lay before you a curious and most extraordinary Fossil, which was lately sent to me for that Purpose by my worthy Friend Dr. *Miles*, of *Tooting*, F. R. S. It consists of 26 Joints, which he calls *Vertebrae*, and I believe supposes to have been the Joints of the Back-Bone or Tail of some Animal; but, upon considering

*. See Sir *Hans Sloane's* Hist. of *Jamaica*, vol. I. p. 29.

sidering them with Attention, they will perhaps rather be judged to be the several articulated Divisions that compose the Body of some kind of *Nautilus*, or of some one or other of the various Species of the *Ammonitæ*: Which Opinion is I think supported, not only by the spiral Figure, which they form when put together, but likewise by the Traces or Markings of such like Articulations, found on some particular Kinds of fossil *Nautili* and *Ammonitæ*; one whereof I also lay before you, as a Proof of this Conjecture.

You will observe all the Parts of this uncommon Fossil are converted into a sort of sparry Substance, and that they are articulated with one another in an exact and beautiful Order. I have fastened them together in two Divisions, that they may be examined more easily than they could be; if they were all separate, and in Confusion: And indeed I am not quite satisfied that these two Bundles belonged both to the same individual Animal; if they did, some Joints must be wanting that came between them, and united them together, as the two Ends do not at present match: And what makes me suspect they did not, is a different Articulation to be observed on one Side of that Division made up of the largest Joints: Besides, the whole Number appears rather too much, and the smaller Joints seem to make up a Body whose Figure is nearly perfect.

Strand, Feb. 9.
1748-9.

Your most obedient humble Servant,
H. Baker.

See TAB. II.

Fig. 1. The larger Joints.

Fig. 2. The smaller Joints.

Fig. 3. and 4. The fore and back Side of a single Joint.
P. S.

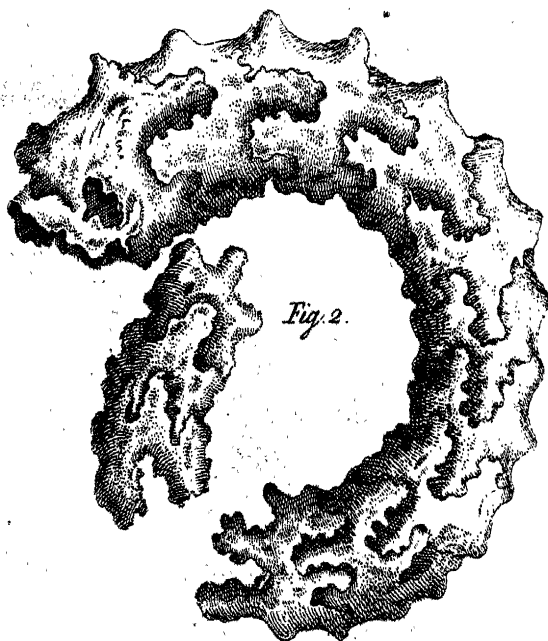
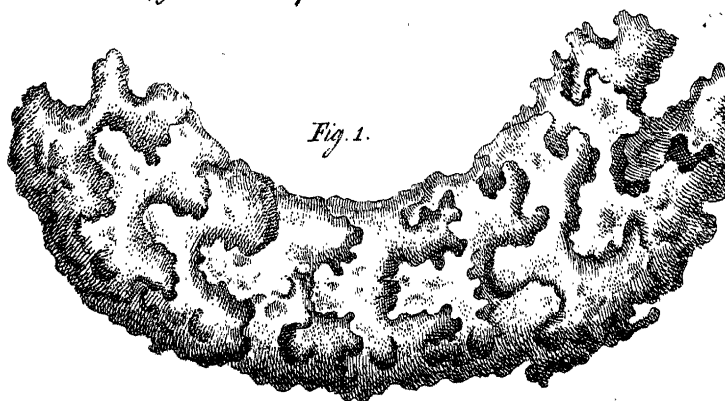




Fig. 3.

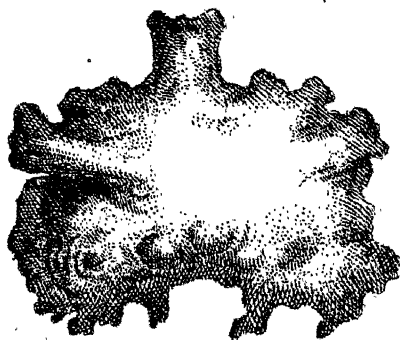


Fig. 4.

P. S. Dr. Miles says they belong to Dr. Clark of St. Alban's; that they were found in Oxfordshire, and were formerly in the Possession of the late Mr. William Becket Surgeon, F. R. S.

XI. *The Case of Mr. Smith, Surgeon, at Sudbury in Suffolk; the Coats of whose Stomach were changed into an almost cartilaginous Substance; communicated by the Rev. Mr. Murdock to Cromwell Mortimer M. D. Secret. R. S.*

Rev. Sir,

Clare, Oct. 11, 1747.

*Read Feb. 9.
1748-9.*

A Greacable to your Desire I send you the material Particulars of Mr. Smith's Case. As there was something uncommon in it, and as it may be for the Benefit of Mankind, which was the Design, and a generous one it was, of my deceased Friend, in resolving a good while before his Death to be opened, I shall take it as a Favour that you will communicate it to Dr. Mortimer. I could not, for the Thing struck me very strongly, forbear making a few Remarks: But I leave it intirely to your Discretion to suppress or send them with the Case. I am,

Dear Sir,

Tours most sincerely,

J. Sayer.

The

The C A S E.

HE was in the vigorous Time of Life, being no more than thirty-six Ycais of Age; and, to all Appearance, of a strong well-set Habit. His Way of living was quite regular; but his Practice of Midwifry, which was pretty large, often forced him in severe Weather from a warm Bed into bad Roads, and sometimes into raw uncomfortable Houses.

He had for several Years complained of Uneasiness at his Stomach; but it was not considerable, till about *January 1746-7*. From that time, he almost constantly threw up his Food within an Hour or two after taking it, and he felt violent Pain about the *Scrobiculus Cordis*. Divers Physicians were advised with, but Medicines availed him nothing; nor had he any Ease, except from Opiates, or spirituous Liquors; and this was of short Continuance.

It being, in the *September* following, recommended to him to go to *Bath*, he for some Weeks drank the Waters, and afterwards bathed. The first had no remarkable Effect; but he found himself worse after bathing. Upon his Return home, new Physicians were consulted, and new Methods were tried, but to no purpose; and, to make Life tolerable, he was forced to be very free in the Use of spirituous Liquors and Opiates.

In *February 1747-8*. he voided, by two or three Stools, about a Couple of Ounces of Matter. Some Weeks before his Death the Pains went off, and his Vomiting was at times stay'd; but whenever that happen'd, whatever he took ran directly through
but

him. And indeed he was now-and then, during the whole Illness, subject to bilious Dejections.

On this Remission of the Symptoms, his Friends flatter'd themselves yet that all might do well; but his Wasting, which had long began, continued; and his Legs, especially one of them, became oedematous. After growing gradually weaker, till Nature was quite spent, he expired, with the utmost Serenity of Mind, in the Evening of *August* the seventh.

His Body being, pursuant to his Request, opened in the Presence of Dr. *Scarling*, and three or four Surgeons, the Coats of the Stomach were found chang'd into an uniform, white, inelastic, almost cartilaginous Substance, which was four Tenths of an Inch in Thickness. Besides this strange Alteration in its Coats, the Stomach was so contracted, as to be incapable of holding more than five or six Ounces; and its inner Surface was besmeared with a various colour'd Matter. The rest of the *Viscera* seem'd to be quite unaffected, and every thing was in its natural Situation, except the *Omentum*, which, besides being, as it is in all tabid Bodies, vastly wasted, was necessarily drawn upwards by the Contraction of the Stomach.

Remarks.

It is highly probable, that this Gentleman's Disorder, whether constitutional or acquired, was at first an Obstruction in those Glands, which separate the Humour that serves to defend the villous Coat from the Acrimony of what is taken into the Stomach, and to prevent its being stimulated by

the Aliment in Digestion ; for want of which it was so subject to Irritation, that scarce any thing would stay upon it. The Matter voided by Stool was undoubtedly formed in the Stomach, because he never complained of considerable Pain in any other Part ; besides, had it been from an Abscess in the Intestines, or any other of the *Viscera*, the Seat of it would in all Likelihood have been apparent. The Looseness, which in the latter Part of his Illness, always attended him when the Vomiting ceased, plainly shews, that the Stomach had at that time acquired a great if not its greatest Degree of Contraction ; for which Reason, as it could contain but little, any Quantity of Food must, if not thrown up, go immediately downwards. The going off of the Pain some Weeks before his Death, was owing to the Sensibility of the Coats of the Stomach being in a great measure, or quite destroyed. The bilious Dejections, that frequently attended him, may be ascribed to Want of Digestion ; which, as little or no Chyle was sent into the *Duodenum*, rendered the Bile useless. The Consequence of this was a Non-secretion of that Humour, an Accumulation of it in the Liver ; or Gall-bladder ; its being reconveyed into the Blood ; or its going off by Stool. If the first or third had been the Case, it would have shown itself in a Jaundice ; if the second, there would have been an Abscess in the Liver or Gall-bladder ; so that of course it must run off by Stool. Spirituous Liquors might help to bring on this Contraction, Inelasticity, and Insensibility of the Stomach : But it seems pretty clear that they were not the sole Cause ; else immoderate Drinkers of them would generally be affected in the same Manner.

XII. A Catalogue of the FIFTY PLANTS
from Chelsea - Garden, presented to the
Royal Society by the Company of Apothecaries,
for the Year 1746. pursuant to the
Direction of Sir Hans Sloane Bart. Med.
Reg. & nuper Soc. Reg. Præf.; by Jos. Miller
Apothecary, Hort. Chelf. Præf. ac Prælect.
Botan.

Presented Feb. 16. 1748-9. 1201. **A** *Diantum Americanum.*
Cornut.

1202. *Adiantum nigrum. Offic.*

1203. *Acriviola maxima odorata, flore pleno. Boerb.*

1204. *Alaternoides Africana Telephii Imperati folio.*
Hort. Amst.

1205. *Alnus nigra. Offic.*

1206. *Aquilegia hortensis multiplex, flore pleno.*
C. B.

1207. *Arum maximum, quod Colocasía vulgò cau-*
libus nigricantibus. Hort. Lugd.

1208. *Asperula odorata, flore albo. Offic. et Dodon.*

1209. *Asteriscus perennis maritimus patulus. Tourn.*

1210. *Buphthalmum orientale, Tanacetí minoris*
folio, flore luteo amplo. Ibid.

1211. *Calendula minor Hispanica. Hort. Lugd. Bat.*

1212. *Chamæpitys lutea vulgaris, folio trifido. C. B.*
et Offic.

1213. *Clinopodium minus, Ocimi facie. C. B.*

1214. *Clinopodium Americanum rotundifolium, Pu-*
legii odore. Houst.

1215. *Convolvulus cæruleus major*, folio subrotundo.
Ger. Park.
1216. *Conyza minima*. *Ger. emac.*
1217. *Corona Solis annua*, flore pleno. *Tourn.*
1218. *Coronilla herbacea*, flore vario. *Ibid.*
1219. *Euphrasia pratensis rubra*. *C. B.*
1220. *Galega Africana*, floribus majoribus, et filiquis
crassioribus. *Tourn.*
1221. *Geranium Africanum* Malvæ folio, petalis
florum inferioribus vix conspicuis. *Index*
Hort. Chelf.
1222. *Guidonia Ulmi foliis*, flore roseo. *Plum.*
1223. *Helianthemum vulgare*, flore luteo. *J. B.*
1224. *Horminum coma* purpureo-violacea. *Ibid.*
1225. *Jacea spinosa alata*, cinerea caule, spinis luteis
longissimis.
1226. *Lavatera*, folio et facie *Althææ*. *Act. Reg.*
Soc.
1227. *Lavatera* flore albo.
1228. *Lotus angustifolia* flore luteo-purpureo, ex in-
sula Sancti Jacobi. *Hort. Amst.*
1229. *Lychnis sylvestris* flore albo minimo. *Raii*
Hist.
1230. *Lychnis sylvestris*, quæ *Saponaria*. *Tourn.*
1231. *Mespilus aculeata*, *Pyri* denticulato folio,
splendens *Virginiana*. *Pluk.*
1232. *Myagrum filiculis longis*. *C. B.*
1233. *Myrtus latifolia Romana*. *Ibid.*
1234. *Myrtus Buxi* folio. *Schyl. Hort.*
1235. *Obeliscotheca minor*, integro folio. *Dillen.*
1236. *Ophioglossum*, *Lingua serpentina*. *Park.*
1237. *Ophris bifolia*. *C. B.*
1238. *Orobis sylvaticus*, *Viciæ* foliis. *Ibid.*
- 1239.

1239. *Pæonia mas.* *Officin.* et *C. B.*
 1240. *Phaseolus flore coccineo.* *Cornut.*
 1241. *Pisum humile caule firmo.* *Tourn.*
 1242. *Polemonium vulgare.* *Ibid.*
 1243. *Rapuntium maximum, coccineo spicato flore.*
Col. in Rech.
 1244. *Rhamnus catharticus.* *Off.* et *C. B.*
 1245. *Satureia hortensis æstiva.* *Ibid.*
 1246. *Sclarea Indica flore variegato.* *Boerh.*
 1247. *Saururus humilis, folio carnosso subrotundo.*
Plum.
 1248. *Spiræa Hispanica, Hyperici crenato folio.*
Tourn.
 1249. *Thuya Theophrasti.* *C. B.*
 1150. *Turritis muralis hirsuta minor.* *Tourn.*

XIII. *The Reverend Mr. Robert Clarke to
 Mr. Fleming, concerning a Boy, who had a
 Calculus formed between the Glans and the
 Præputium.*

S I R,

Read Feb. 23. 1748-9. UPON Inquiry, I find that the Boy
 you desire to have an Account of,
 from his Infancy labour'd under the Difficulty of
 making Water; for tho' he was three Years of Age,
 when put under the Care of the Person from whom
 I have this Intelligence, yet he could not go alone.
 He was in the greatest Agony upon every Motion;
 but was relieved by putting a great Pin, the Head
 foremost,

foremost, an Inch, at least, between the Prepuce and the Stone; when sometimes a mucous, sometimes a gritty Matter, would first ouze out, and then came the Urine with some Violence.

During this time, the End of the *Penis* was observed to grow in the Form of, and as big as, a Hen's Egg; occasioned, as may be imagined, by the Concretion of the Stone between the *Glans* and the *Prepuce*. At last there was a total Suppression of Urine for 48 Hours at least, attended with an Appearance of a Sore in the Side of the *Penis*, out of which the stony Concretion which I gave you dropp'd; and from that time, all the while the Boy continued under the same Person's Care, which was about half a Year, the Urine was discharged at the Side, with less and less Pain. Last Summer he came to see his *quondam* Nurse, and told her that he was now perfectly well. His Age now is about 23. His Name *John Blackhouse*, I am,

S I R,

Houghton Conquest, Jan. 21.

1748-9.

Your very humble Servant,

Robert Clarke.

XIV. *The Establishment of a new Genus of Plants, called Salvadora, with its Description; by Laurence Garcin M. D. F.R.S. of Neufchatel in Switzerland; communicated in a Letter to Dr. Mortimer Secr. R. S.*

Translated from the French, by T. Stack M. D.

Read Feb. 23. 1748-9. **T**HIS Plant is woody. It grows some-

times into a Tree, sometimes into a Shrub, and sometimes into a Bush; spreading very tufted Branches on all Sides down to the Ground. Its native Countries are the Parts adjacent to the *Persic Gulph*, the North of *Arabia*, and the South of *Persia*. I cannot find that any Author has known, or made the least mention of it.

First I will give its Characters, and then its Description from accurate Observations, which I have made on the Spot.

Characters.

Calix. This is a monophyllous Cup, divided into four Lobes, which, as soon as they spread open, turn outward, and roll backward on themselves; then wither, grow whitish, and dry up.

Corolla. Its Flower is void of Petals.

Stamina. These are four in Number, answering to the four Lobes of the *Calix*, and being likewise of the same Length. They spring from the Basis of the *Pistillum*, and, as they shoot up, tend outward.

Their

Their Summits are round, with a Furrow turning in on one Side; which gives each of them the Form of a Purse.

Pistillum. It is round, its Style single and short, and the *Stigma* is blunt, and shaped like a Navel.

Pericarpium. Is a round Berry, of a middle Size, with one Cell or Lodgment in it.

Semen. It is single, spherical, inclosed in a callous firm Skin, beset with Spots, forming a sort of Husk like that of Hemp.

I know but one Species of this *Genus*, which I describe thus.

Description.

It is a Plant which varies considerably in Size; that of a larger sort of Shrub, is what it most frequently grows to. It produces a Number of Boughs without Order, and very tufted Branches, which most commonly hang down to the Ground. Its Bark is moderately thick, sometimes smooth, sometimes full of Cracks, of an Ash-colour, both in the Trunk and Branches, but green on the tender Shoots. Its Wood is every-where brittle, and nearly of a Straw-colour.

The Leaves are borne on young Sprigs, which shoot out along the Boughs. These Sprigs are strait, generally short, but sometimes pretty long, like little Wands. The Leaves are thick-set, and tufted on the former, but thin on the latter. They grow sometimes opposite to one another by Pairs, crossing alternately; and sometimes by three and three, disposed like Rays; but this more rarely. Their Length, which varies on the same Stalk, is generally from

from an Inch and half to two Inches and half, and their Width is from nine Lines to an Inch a little below the Middle in each, which is the widest Part. They are thick, pointed at their Extremity, and rounded at their Base, very even on their Edges, somewhat succulent, but firm: Their Colour is a pale Green, but somewhat yellowish, in those that are shooting out. The Pedicles which support them are very short, each being but half a Line in Length, and a quarter in Thickness. Every one of these Pedicles, which is round, furnishes a little Nerve, which runs thro' the middle of the Leaf; it is a little hollowed on the upper Side, and somewhat raised on the Back; and terminates at the End of its respective Leaf. This Nerve gives two or three Pair of almost imperceptible Threads, which spread and divide into other small irregular Threads, thro' the Body of the Leaf. In fine, these Leaves in Shape nearly resemble those of the Sea-Purslain, and sometimes those of the Mistletoe of the Apple-tree. There are some generally on each Plant, which have one, two, or more black Spots, as in the *Persicaria*, but almost round, and smaller.

The Flowers, which are stamincous, that is, without Petals, are small, and disposed in Clusters on the Tops of the Shoots. These Bunches of Flowers intirely resemble those of the Vine-Blossoms. The Empalement is small, green on the under Side, having four Segments almost pointed, which roll outward, and then dry up. Its Diameter in this rolled State of its Lobes, is but of one Line. The *Stamina* are of a Straw-colour. The hollow Furrow in each

of their Summits is not easily discover'd without a Glass.

The Pistil or *Embryo* of the Fruit, which is little, and yet occupies the whole Inside of the *Calyx*, is of the same Colour with the Bottom of this, that is, green. Afterwards it swells in all Dimensions, and grows into a Berry, of the Shape and Size of a Gooseberry, of three or four Lines in Diameter. At first it is of a pale Green, then a bright Purple, and in its Maturity of a dark Red. Each Berry is supported on a strong thick Pedicle, attached to a small Bunch. Its Substance is a white transparent Flesh, full of Juice, much resembling Jelly, which surrounds a single round Grain, marbled with black or brown Spots, as in the Tortoise-shell, when ripe. This Grain is as large as a Grain of Hemp-seed, that is, about two Lines in Diameter, but sometimes less. It is properly a Kernel, or a Shell that has a Cavity, which incloses a sort of little round Almond, of a Straw-colour, yellowish on its outward Surface, and pale in its inward Substance, which is pretty firm.

Qualities.

All the Parts of our Plant have an acid pungent Taste and Smell, vastly like our Garden-Cresses, but more biting. The Fruit is the most pungent Part of the Whole. The Smell of the Plant is perceptible at seven or eight Paces Distance, when a Person is to Leeward.

The Natives of the Country use it against the Bite of the Scorpion, by rubbing the wounded Part with its bruised Leaves. They also employ its warm Infusion to wash the Bodies of their Children, in order

to keep them healthy. And they feed Camels with it, who love it naturally.

Remarks.

This Shrub, which is sometimes large, sometimes small, is most commonly found along high Roads, and in dry low Places of its Climate. As its Branches, which are slender and brittle, spontaneously bend downward, and form a thick Tuft, this makes it generally resemble a great Bush, which takes up a good deal of Ground in most Places, where it grows naturally. It delights in the hottest and driest Places, such as those adjacent to the *Persic Gulph*, and perhaps more so than Palm-Trees: Wherefore I doubt of there being any growing in the Countries that lie to the East of the *Gulph*. And accordingly I have met with none, either in the Neighbourhood of *Surat*, or in the Kingdom of *Bengal*, where there are regular rainy Seasons every Year.

I should rather believe, it is more likely to be found in the Deserts of *Africa*, on this Side of our Tropic; those being proper Places for it, and where it rains seldomer than in any other Part of the Globe.

Its Leaves have frequently Excrescences of different Sizes and Shape, round, oval, and sometimes very large. They are the Work of those flying Insects, which commonly abound in these Parts.

The Inhabitants of the *Gulph* call this Shrub by the Name of *Tchuch*. Perhaps its Nature would not allow it to grow in Lands far distant from the Sea, no more than the *Sea-Plants*, to which this Sur-name is given for that Reason.

Its Parts are all brittle, and even the Leaves crack, if bent in the Middle.

In fine, I have chosen a Name, which I imagined I ought to give it, after the Example of Mr. *Linnaeus*, who has called several Plants by the Names of Botanists of Reputation. This laudable Proceeding is a Way to perpetuate the Memory of all those who have contributed to the Progress of Botany; and that much better than Medals do with regard to Princes or Emperors. A Proceeding, which, if duly pursued, will encourage those who come after us, to make useful Discoveries in this Science for the Good of Mankind, and in much greater Number than have been published on the Subject of Plants up to our Times. For it is easy to comprehend, that what remains to be discovered on this Subject for our Use, must infinitely surpass all that Man has hitherto found out.

The Name of *Salvadora*, which I have chosen for our Shrub, is that of the late Mr. *Salvador* of *Barcelona*, a very skilful Botanist, of whom *Mons. de Tournefort* makes mention in his Introduction, which serves for a Preface to his *Institutiones rei herbariae*, where he styles him *the Phoenix of his Nation*; because he was really the richest Naturalist, and the most expert in botanical Matters that *Spain* ever produced. Before the last Siege of *Barcelona*, in the Years 1713 and 1714 they herborized together in *Catalonia*, and on the *Pyreneans*, while *M. de Tournefort* was on his Travels there. They were intimate Friends, and carried on a Correspondence some Years: And as I was personally acquainted with him for three or four Years, and have
likewise

likewise herborized with him before the said Siege, and have since been honoured with his Friendship and Correspondence, I thought it incumbent on me to do Honour to his Memory, by giving his Name to this Plant. And I have done it with the greater Justice, because it is certain, that, had he lived, he would have given a History of the Plants of *Spain*, which, by its Accuracy, would have afforded much Pleasure to the Botanists of *Europe*.

To conclude ; from the Characters of our *Salvadora* it is manifest, that its Place in *Tournefort's* System ought to be in the first Section* of the 18th Class. In the System of Mr. *Linnaeus* it ought to be placed after the *Rivina* in the fourth Class, which receives Plants with four *Stamina* (*Tetrandria* and *Monogynia*).

* Among Trees and Shrubs having *apetalous* Flowers with the Fruit joined to them ; to which Section belong the *Fraxinus* and the *Siligna*.
C. M.

XV. A State of the English Weights and Measures of Capacity, as they appear from the Laws as well ancient as modern; with some Considerations thereon; being an Attempt to prove that the present Avoirdupois Weight is the legal and ancient Standard for the Weights and Measures of this Kingdom; by Samuel Reynardson Esq; F. R. S.

Read March 9. 1748. **I**T is declared by (1) *Magna Charta* that there should be, throughout the Realm, one Measure of *Wine* (2), one of *Ale*, and one of *Corn*; viz. the *Quarter* (3) of *London*; and that it should be of *Weights* as of *Measures*.

This Declaration has been repeated in many subsequent Laws (4), and by several of them the Treasurer is directed to provide Standards of *Bushels*,
Gallons,

(1) c. 25.

(2) Bishop *Fleetwood* says, it was a good Law of king *Edgar*, that there should be the same Weight and the same Measures throughout the Realm, but it was never well observed. *Chron. pretiosum*, p. 34. — And, 2 *Inst.* p. 41. says, This Law was grounded upon the Law of God, *Deut. xxv. ver. 13, 14.* — and that there were good Laws for Weights and Measures made before the Conquest by *Canute*. See *Custum. de Norm.* c. 16.

(3) See p. 64. of this *Transact.* the Contents of a *Quarter*.

(4) 51 *H. III. St. 6.* 14. 25, and 27. *Ed. III.* 13, 15, and 16 *R. II.* 9 *H. VI.* 11 *H. VII. c. 4.* 16 *Car.* . and 22 *Car. II cap. 8.*

Gallons, and Weights, of Brads; and to send them into every County; and all Measures are to be made according to the King's Standard; the *Affize* whereof is established by several Laws (1), as follows: 'The *English* Penny, called a Sterling round, without clipping, to weigh 32 Grains of Wheat dry, and taken from the midst of the Ear. 20 Pence make an Ounce, 12 Ounces a Pound. 8 Pounds make a Gallon of *Wine* (2). 8 Gallons of *Wine* make a *London* Bushel (3), which is the eighth Part of a Quarter.' And by other Laws (4) it is declared, That the Tun of *Wine*, *Oil*, and *Honey*, should contain, of the *English* Measure, according to the antient *Affize*, 252 Gallons; the Pipe or Butt 126; The Tertian 84; the Hogshead 63; and every Barrel $31\frac{1}{2}$, according to the *old Affize*, and to be gaged by the King's Gager.'

In the Reign of *Edward III.* (5) an Act passed to take away the Weight called *Ancell* (6), whereby, and by subsequent Statutes, it is directed, that every Sale and Buying should be by the even *Balance*.

In

(1) 51 *H. III. St. 1. c. 3.* 31 *Ed. I. 12 H. VII. c. 5.*

(2) The 12th *H. VII. c. 5.* says *Wheat*.

(3) 9 *H. VI. c. 8.* says — Buyers of Corn in *London* bought by a Vessel called a *Fat*, containing 9 Bushels of Corn; which is forbid by the Act.

(4) 2 and 18 *H. VI. 1 R. III. c. 13.* 5 *Ann. c. 27 § 19.* 23 *H. VIII. c. 7.* 2 *H. VI. c. 11.*

(5) 25 *Ed. III. St. 5. c. 9.* 34 *Ed. III. c. 5.* 8 *H. VI. c. 5.* 9 *H. VI. c. 8.*

(6) King *Stephen* (says *Knighton*) settled Measures of Length and of Land, and made Appointments *de Anfulis, Bilancibus, &c. Decem Scriptores, p. 2391.*

In the 11th Year of *Hen.* VII. Complaint being made to the Parliament, that the ancient Statutes and Ordinances of the Realm relating to Weights and Measures had not been observed and kept, it was therefore Enacted, ‘ That there should be delivered to the Knights and Citizens of every Shire and City, one of every Weight and Measure, which the King had caused to be made of Brass, according to his Standard in the Exchequer, to be delivered to the respective Places mentioned in the Act; and that the Inhabitants of all Cities, Boroughs, and Market-Towns, should make and use *Weights* and *Measures* made according to the Weights and Measures so delivered as aforesaid.” In the next Year another Act passed, reciting, ‘ That the King had made such Weights and Measures of Brass, according to the *old* Standard thereof remaining within his Treasury; which Weights and Measures, upon more diligent Examination, had been *approved* defective, and not made according to the Statutes and *old* Laws, and were therefore recalled, and ordered to be broken, and other new Bushels and Gallons were directed to be made and *fised*, according to a new Bushel and Gallon to be made according to the *Affize*, to remain in the King’s Exchequer:’ Where we now find a *Bushel* in the Custody of the Chamberlains called the *Winchester* Bushel (1), and a Gallon agreeing thereto: Upon the
Bushel

(1) The first time I find it so called by any Law, is in an Act 22 C. II. c. 8.: And afterwards it is called by this Name in several Acts of Parliament; but in the Act just now mentioned, it is
said

Bushel there is the following Inscription ; *Henericus septimus Dei gratia Rex Angliæ et Franciæ.*

In the last-mention'd Act, the *Affise* for Weights and Measures is in Substance the same as in the *old* Statutes, only the Pound is said to be the *Pound Troy* of 12 Ounces. But since by this and the former *Affise* Laws the Pound is directed to be raised from 240 Sterling Penies, it follows, that the Gravity of the *Affise* Pound was always the same ; but the Dimensions of Measures of Capacity respectively raised from a Pound of Wine, and a Pound of Wheat, will be in proportion to each other as the specific Gravity of Wheat to that of Wine or Water.

Thus continued the Laws relating to the *English* Standard of Weights and Measures till after the Restoration ; when a Duty of Excise (2) being laid upon Beer, Ale, and other Liquors, 36 Gallons taken by the Gage, according to the Standard of the Ale-Quart, (4 whereof made the *Gallon* remaining in the *Exchequer*) were to be reckoned as a Barrel of Beer, and 32 such Gallons a Barrel of Ale ; and afterwards (3) 34 such Gallons of Vinegar (and of Beer or Ale stronger or small without the Bills of Mortality) were declared to be a Barrel ; and all other Liquors liable

to

said to be *commonly* called the *Winchester* Measure. Perhaps it first took that Name from the Statute made at *Winchester* 16 R. II. which directs the Clerk of the Market to have all his Weights and Measures ready, and marked and signed according to the Standard of the Exchequer.

(2) 12 C. II. c. 24. § 20.

(3) 1 W. and M. c. 24. § 5. 10 W. III. c. 21. 11 and 12 ditto, c. 15.

to the Excise-Duty were to pay according to the *Wine Gallon*.

We now find the Officers of the Revenue determining the Contents of our Measures of Capacity with great Exactness: For, on the 25th of *May* 1688, two general Officers of the Excise, in the Presence of the Lord-Mayor, the Commissioners of Excise, Mr. *Flamstead*, and others, upon an exact Trial found that the *old Standard Wine Gallon*, kept in *Guildhall*, did contain but 224 cubic Inches; nevertheless, at that time it was thought convenient to continue the former supposed Content, being 231 cubic Inches, as the *Standard Wine Gallon*, and which has since been established by a Law (1).

In the Year 1696, an Experiment was made, in order to fix the true and exact Contents of the Brass *Standard Bushel* of *Henry VII.* which being filled with common Spring-Water, and the Water measured out with great Nicety and Exactness; the Bushel (2) was found to contain 2145,6 solid or cubic Inches; and the Water being weighed by the Standard Weights in the Exchequer (and by a Beam, which would turn with six Grains put into either Scale, with 30 Pounds in each Scale) was found equal to 1131 Ounces 14 Pennyweights *Troy*; and at the same Time and Place the Standard *Troy* Weights were compared with the Standard *Avoirdepois*, and 15 Pounds

(1) 5 *Ann. c.* 27. § 17. — This Act says, Any Cylinder 7 Inches Diameter, and 6 Inches deep, or any Vessel containing 231 cubic Inches, and no more, shall be a lawful Wine-Gallon.

(2) *Everard's Stereometry*, p. 193.

Pounds of the latter were found equal to 18 Pounds 2 Ounces 15 Pennyweights *Troy*; which fixes the Pound *Avoirdupois* at 7000 (1) such Grains, as the *Troy* Pound weighs 5760; and upon three several Trials, made by the Gentlemen of the *Council* of the *Royal Society*, at the Exchequer, upon a Medium the *Avoirdupois* Pound was found equal to 7000,25 *Troy* Grains.

By the first (2) *Malt Act*, which passed soon after the making the Experiment upon the *Winchester* Bushel, it is declared, that every Bushel 18 Inches and $\frac{1}{2}$ wide, and 8 Inches deep, should be esteemed a legal *Winchester* Bushel: And the *Coal* Bushel is directed (3) to be made 19 Inches and $\frac{1}{2}$ Diameter, and to contain the last Bushel and one Quart of Water. The first contains 2150,42 cubic Inches, the last 2217,47.

We now see different Measures established by Law (4); and under the Excise Laws, two different Gages or Measures, used for taking the Dimensions of *Wine* and *Ale* Vessels. The *Wine* Gallon contains 231 cubic Inches, and the *Ale* Gallon 282; but upon what Foundation this last Measure was established is difficult to determine.

Troy

(1) *Ward*, in his *Young Math. Guide*, says, 6999 $\frac{1}{2}$ Grains. *Phil. Transf.* N^o. 465. p. 181. and N^o. 470. — *Bishop Hooper* 10. *Pharmacopœia Londin.* says, — The *Avoirdupois* Pound is said to be about 7000 Grains.

(2) 13 *W. III.* c. 5. § 28. and 1 *Ann. St.* 2. c. 3. § 10.

(3) 12 *Ann. St.* 2. c. 17. § 11.

(4) Though contrary to *Magna Charta*, and several other Laws not repealed.

Troy Weights had for some time been established and used for the Money Affairs in the *Mint*, and for weighing Gold, Silver, and some few Commodities; and the *Avoirdepois* were in general Use for weighing all heavy and gross Commodities. *Wine* Measure was generally look'd upon as equal to *Troy* Weight: From hence the Managers of the *Excise* Duty were perhaps led to fix the Standard of the *Ale* Gallon, bearing the same Proportion to the *Wine* Gallon as the *Avoirdepois* Pound did to the *Troy*; and according to this Conjecture, the two Gallons answer pretty exactly (1); the *Ale* Gallon exceeding the Proportion by somewhat more than one cubic Inch and one Quarter; but it exceeds the *Winchester* Gallon, or 268,2 cubic Inches by very near 14 cubic Inches: And not one of these Measures is agreeable to the Words of the *Assise*, which directs, (2) 'That the *Bushe*l shall contain 8 Gallons of Wheat, ' the *Gallon* 8 Pound of Wheat of *Troy* Weight, ' the *Pound* 12 Ounces of *Troy* Weight,' &c. according to the *old* Laws of this Land.

It is very plain the Law-makers in *Henry* the VIIth's Time took the *Troy* Weight for the Standard; and most Authors who have wrote upon this Subject have follow'd their Example.

The great Difficulty we are under in fixing upon a *Standard Pound*, agreeable to the *Assise*, arises from the Uncertainty of the Rule laid down in our Laws
of

(1) For, as 144 : 175 :: 231 : 280, 729 — And as 144 : 175 :: 224 : 272, 222. This last comes very near the vulgar dry Gallon.

(2) 12 H. VII. c. 5.

of *Affise* for raising the *Pound* from 7680 Grains of *Wheat*; as these Grains differ in Weight, in different Countries, and in different Years, I might have said in the same Field, and in the same Year.

The Uncertainty of a *Pound* so raised might with great Probability occasion the Variety in our Weights and Measures, so often complained of in our *ancient* Laws, and for the Prevention whereof *Edward III.* in his 14th Year, ordered ‘ *Standard Weights* and ‘ *Measures* to be made of *Brass*, and sent into every ‘ *City and Town* in the Kingdom.’

The Laws of *Affise* never received any Alteration, except by the 12th of *Hen. VII.* when the *Pound* is declared to contain 12 Ounces of (1) *Troy Weight*, and the Gallon 8 Pounds of *Wheat* of *Troy Weight*; and since the Laws have received no Change, we have great Reason to conclude, that the Standard Weights themselves never suffer’d any Addition or Diminution; but however this be, we (2) now find in the Custody of the proper Officer of the *Exchequer*,

(1) This is the first time the Standard Weights are called *Troy* Weights. But in an Act 2 *H. V. St. 2. c. 4.* and 2 *H. VI. c. 13.* relating to *Goldsmiths*, there is mention made of *The Pound of Troy*.

(2) *Phil. Transf.* No. 470. — The *Avoirdepois* Weight of 14 Pounds is marked with a crowned E. and inscribed

XIIII POUND AVERDEPOIS.

ELIZABETH. REGINA.

1582.

The *Troy* Weights marked with a crowned E. are Ounces, from 256 down to the 16th Part of an Ounce: And there are no whole Pounds *Troy*, Penny Weights, or Grain Weights, at the *Exchequer*. There not being Pounds, or greater Weights, seems to be a Proof that these Weights were never designed or used for determining the Weight of large Bodies, or heavy Goods.



quer 2 Setts of Weights, kept there as Standards; one called *Troy*, the other *Avoirdupois* Weight.

As there is no Account handed down to us by our Ancestors, shewing at what time, and upon what Occasion, these Weights, differing considerably in Gravity from each other, were there first deposited, we are at a Loss to determine which is the *ancient Standard Weight* described by the Laws of *Affise*.

The Act in the 12th of *Hcn. VII.* has called the Standard Weight by the Name of *Troy Weight*; this is the first time the Weights are so called in any of our *Affise* Laws; and notwithstanding this Authority, it will be found very difficult, if not impossible, to reconcile the *Troy Weight* and *Measure* raised therefrom with the Words of the *Affise*, and any Measures now in being; for the natural and most ready Way to determine this Question is to compare both the *Troy* and *Avoirdupois* Weight with Measures raised from each, according to the Rule laid down in the *Affise*, and with such Measures as are or have been used by Authority.

‘ The most exact (1) and *geometrical* Way of expressing the Capacity of any Vessel or Measure is
 ‘ by expressing in known Terms the Solidity of a
 ‘ Body which will precisely fill it: The fittest will
 ‘ be Water. The Solidity of all Bodies is best expressed by the Help of a Cube, whose equal Sides
 ‘ we

(1) Bishop Cumberland's Essay, p. 60. — who also says, The Egyptians made their *Ardoob* the Cube of their known Standard the *Cubit*: — And that the Romans made their *Quadrantal* the Cube of their Standard the *Foot*.

‘ we know by a Standard Measure of Length ; and it
 ‘ appears, that this Way of determining Measures of
 ‘ Capacity is not only the most geometrical, but
 ‘ also exceeding ancient (2)’. By this Rule some
 Gentlemen at *Oxford*, in the Year 1685, determined
 the Weight of a *cubic* (3) *Foot of Spring Water*, or
 1728 solid Inches, to be 1000 Ounces *Avoirdepois* ;
 and by the same Rule the Capacity and Contents of
 the *Standard Bushel* in the *Exchequer* was deter-
 mined in the Year 1696, with great Care and Exact-
 nefs: By the same Rule the Contents of other Ves-
 sels of Capacity have been settled ; and in the fol-
 lowing Table p.71. I have inserted the Names of such
 Measures as are of any Authority, whose Contents
 are known ; by which the Proportion they bear to
 each other, and to Measures raised according to the
Assise, as well from the Pound *Troy* as the Pound
Avoirdepois, will be readily observed.

In the next place let us compare the Experiment
 made upon the *cubic Foot* of Spring Water with that
 upon the *Winchester Bushel*, and we shall find an
 uniform and perfect Agreement between them ; and
 that, upon each Trial, a cubic Vessel, the Sides
 whereof were equal to an *English Foot*, did contain
 (4) 1000 Ounces *Avoirdepois* of Spring Water. From
 hence

(2) *Measures of Bodies* are either determined by their solid Con-
 tents, or Weight. Measures of Content are formed from Cubes of
 assigned Lengths. Bishop *Hooper*, p. 2.

(3) *Phil. Transf.* No. 169.

oz.	pau.	Cu. In.	oz.	Cu. In.
(4) For as 1131. 14		Troy : 2145,6 :: 1000		<i>Avoir.</i> :: 1728,041.

Some Writers upon this Subject say, that a cubic Foot of Spring-
 Water

hence we are led to the Discovery of a *natural* and *universal Standard* for the *English Weights* and *Measures*; and such an one as is, in every respect, agreeable to the Words of the *Affise* recorded in our most *ancient* Laws.

Magna Charta points out the *Quarter* of *London* as the only Standard for Measures and Weights of that time; but we are left to guess of what Measure or Weight it was the Quarter Part. If we suppose it the Quarter of a *Ton*, or 2000 Pound Weight, then the *Quarter* was 500 Pounds, and the eighth Part of that, or a *Bushel*, was equal to a *cubic Foot*, or $62\frac{1}{2}$ Pounds; from whence less Measures and Weights were easily deduced. Subsequent *Affise Laws* direct the greater Measures to be raised from the less; that 8 Pounds should make a Gallon; 8 Gallons a Bushel; which was to be the eighth Part of a Quarter; and by this Rule the *Quarter* is raised to 512 Pounds, and the *Ton* to 2048 Pounds. These Measures and Weights are raised with Ease from known Parts of the *Foot*. For a cubic Vessel, whose Sides are equal to $\frac{1}{10}$ of a Foot, will contain a Cube of Spring Water equal to an *Ounce Avoirdepois*; and from hence, by a regular *geometrical Progression*, we shall obtain
Cubes

Water is equal to 76 Pounds *Troy*; which is 10 Pennyweights 20 Grains more than the 1000 *Avoirdepois*. See *Arbuthnot's Tables explain'd*, p. 80, 283. *Bishop Hooper's State, &c.* p. 11. — But the *Explainer* of *Arbuthnot's* Tables seems to have been quite ignorant of any Experiment since Sir *Jonas Moore's* Time; and to have disregarded the due Proportion between the *Avoirdepois* and *Troy* Pound; and for 175. to 144. his Tables, he says, are calculated at 17. to 14.

Cubes equal to ⁽¹⁾ 8 — 64 — 512 Ounces, or to 4 — 32 — 256 — 2048 Pounds *Avoirdupois*: And from a cubic Vessel containing one such Pound, we shall have other cubic Vessels, equal in Weight 8 — 64 — 512 Pounds; and in Measure to the *Gallon*, *Busbel* and *Quarter*, according to the *Affise*.

The ⁽²⁾ *Gallon*, *Busbel*, and *Quarter*, are called dry Measures; and are used for ascertaining the Quantity of Corn, and other dry Goods; the *Gallon* is also a liquid Measure raised from a *Pound*, in Liquids now called a *Pint* ⁽³⁾; from whence all the other liquid Measures are raised; but with this Difference in the Proportion, that the *liquid Busbel* is not 64, but 63 Pounds or Pints; eight whereof make the *Hogshead* equal to 63 Gallons; from whence the Contents, as well of the larger as smaller Vessels or Measures of Capacity are settled.

The *Measures of Capacity* thus raised, are sufficiently convenient for common Use, and are generally retained at this time; but for *Weights*, there has been some Variety from time to time, in the Composition of the larger sort, used for determining the Weight of Merchandize and heavy Goods, as will appear from the following Extract from several old Acts

(1) Eight Ounces are equal to a *Mark*, whereof two, or twice the Contents of that Cube make a Pound *Avoirdupois*.

(2) The Half-Bushel, Peck, Gallon, Pottle, and Quart, are directed by 25 *Ed. III. St. 5. c. 10.* to be made according to the King's Standard.

(a) See Bishop *Hooper*, p. 6.

(3) See *Note (5)* of p. 66. *infra* — The *Pint* is not mention'd in the *Affise* Laws; but Bishop *Hooper* has given a long and *learned* Dissertation upon that Measure, and calls it the *Pint of Old*, p. 458.

Acts of Parliament.—The *Stone* for weighing *Lead* was (1) settled at 12 *Pounds*; for *Wax*, *Sugar*, *Spices*, and *Allom*, at 8 *Pounds*; of which last, $13\frac{1}{2}$, or 108 *Pounds*, made the *hundred Weight*: The *Sack* of *Wool* (2) was to weigh but 26 *Stone*, 14 *Pounds* to each *Stone*: A *Weye* (3) of *Cheese* 32 *Cloves*, each *Clove* 7 *Pounds*. And for many Years past, the *Hundred weight* has been fixed (4) at 112 *Pounds Avoirdupois*, and that by a general Consent, and without any particular Law to establish it.

These *Weights* have been universally and immemorially (5) used in *England*, with an Exception to the weighing of *Gold*, *Silver*, and some very few *Commodities*, for which the *Troy Weight* has been used for a great many Years. When it was first introduced

(1) *Cay's Abridgment Title Weights*, § 9.

(2) 25 *Ed. III. St. 5. c. 9.* 13 *R. II. c. 9.*

(3) 9 *H. VI. c. 8.* The *Weye* equalled 224 *Pounds*.

(4) That is, 14 *Stone* at 8 *Pounds*, or 8 *Stone* at 14 *Pounds* each, according to the *Old Laws*, and present Usage of the *Stone Weight*. The 112 *Pound* is a very convenient *Weight* for a *Standard*, because it is divisible into more even *Parts* than any less *Number*. — And it is compounded from the *Affise Bushel*, its *Half* and *Quarter*; that is to say, 64.32, and 16 *Pounds*.

(5) The *Apothecaries* (who, next to the *Goldsmiths*, are supposed to make the most Use of *Troy Weights*) seldom keep *Weights* adjusted to the *Troy Pound* heavier than two *Drams*; but for all above buy and sell by *Avoirdupois*: And with them, by the Term *Libra* in Measure is meant the *Wine Pint*; tho' this Measure is not, say they, so denominated from its containing an exact *Pound-Weight* of any *Liquor*, and the Term *Uncia* in Measure does not denote a twelfth Part of the *Pint*, but the sixteenth; though in *Weight*, agreeable to its Signification, it is used to express one twelfth Part of a *Pound*; so that an *Ounce* in Measure is scarce more than three Quarters of an *Ounce* in *Weight*. See *Pemberton's Dispensary* p. 44.

introduced into this Kingdom, does no-where appear; but Mr. *Folkes*, in his Tables of the *English Silver Coins* (¹), tells us, it was not established or used at the *Mint* before the 18th of *Hen. VIII.*

By reducing the *liquid Bushel*, or one Eighth of the *Hoghead*, from 64 to 63 Pints, it seems plain, that our Ancestors took the *cubic Foot* for their *Model*; the Contents of such a Vessel being $62\frac{1}{2}$ Pints or Pounds: And from hence, and from what has been shewn before, it is not very unnatural to conclude, that at first our Ancestors fixed and established as well their Weights as Measures from known Parts of this *Model*; taking always a whole Number for each *primary Weight* or *Vessel*; and from thence proceeding, by a regular *geometrical* Proportion, to raise the greater Weights or Measures: So that the *English Foot* (the undoubted and universal *Standard* of all *Measures of Length* within this Realm) is also the *Standard* for the *Avoirdepois* (²) Weights, and all Measures of Capacity.

Upon

(1) *Page 4.* Mr. *Folkes* says, The Pound used at the *Mint* before that time, called the *Tower* or the *Moneys* Pound, was equal to 5400 *Troy Grains*: And, *p. 13, 14,* that the Weight of the Groat, from 13 *Hen. IV.* to 4 *Edw. IV.* was equal to 60 such Grains. Which is agreeable to what is said in an Act of Parliament of 2 *Hen. VI.* that the Pound *Troy* of coined Money was worth 32 Shillings; for 32 Shillings, or 96 Groats, at 60 Grains each, weigh 5760 Grains, or a Pound *Troy*. Tho', by the same Act, by reason of the Scarcity of Silver Money, and in order to bring Bullion into the Mint, it was enacted, That Silver uncoined, of the same Goodness as the Money, should be sold only for 30 Shillings the Pound *Troy*.

(2) The very Name *Avoirdepois*, by which our common Weights are known, has by some been looked upon as a Proof that they were

Upon the whole therefore, I think it is sufficiently proved, that a *cubic Vessel*, whose Sides are equal to an *English Foot*, will contain 1000 Ounces *Avoir-depois*, or very near that Weight of Spring-Water : That Weights and Measures, deduced by a regular *geometrical Progression* from such a Vessel, or from cubic Vessels, whose Sides are equal to known Parts of an *English Foot*, bear an exact Analogy to each other, and 10 Weights and Measures raised from a *Pound*, according to the Words of our most ancient *Assise Laws*. This being considered, and that the *Avoirdepois* Weight is now in common Use for determining the Gravity of all heavy Bodies, that this

Weight

were of foreign Extraction. The first time I find the Word used in our Laws, is in an Act of *Ed. III. St. 1.* where it is applied to *Wines* as well as *Corn* ; as it is afterwards in *25 Ed. III. St. 3. c. 2.* and *16 R. II. c. 1.* And in an Act *27 Ed. III. St. 2. c. 10.* there is the following Clause :— ‘ Because we have perceived some Merchants buy *Avoirdepois* Merchandizes by one Weight, and sell by another, we will and establish, that *one Weight, one Measure, and one Yard*, be through all the Land ; and that *Wools*, and all manner of *Avoirdepois*, be weighed by even *Balance*.’ This King, in his 14th Year, had directed *Standard Weights* to be made of *Brass*, and sent into every *City and Town* ; and I conjecture, that those *Standards*, from the Words of the foregoing Clause, took the Name of *Avoirdepois*, and were the Weights by which the Merchants used to buy. What were the lighter Weights by which they sold, does not appear ; perhaps the *Pound Troy*. That the former were the *lawful* Weights, appears by an Act *24 H. VIII. c. 3.* where they are so called ; and Butchers, who before that time sold their Meat by Hand, were thereby obliged to provide themselves with Beams, Scales, and Weights *sealed*, called *Flaberdepois* (for *Avoirdepois*) ; and in the next *Reign* the *Avoirdepois* Weights, now remaining as *Standards* in the *Exchequer*, were deposited there, as appears from the Name and Inscription thereon.

Weight now is, and immemorially has been, used for settling the ancient Duty of *Tonnage* and *Poundage* upon all Goods and Merchandize taken by Weight (except some few Drugs, which are charged in the Book of Rates by the Ounce *Troy*); and that there is not the least Proof, either in our *ancient* or *modern Laws*, to induce a Belief that this Duty was ever generally taken by the *Troy* Weight, or that *Troy* Weights were ever in general and common Use in this Kingdom, it must surely be allowed, that the Weight mentioned in our *old Laws*, or Acts of Parliament, was the *Avoirdepois* Weight.

Postscript.

The learned Bishop *Cumberland*, in his ⁽¹⁾ Treatise, says, ‘ That our *English Avoirdepois* Ounce is the same as the *Roman* Ounce; and was probably introduced into this Kingdom by the *Romans*, when they gave Laws and planted Colonies here, and hath thence continued unchanged to this Day; which is not commonly observed, because we use the *Avoirdepois* Weights only about heavier Commodities; not in weighing Silver and Gold, which are weighed by the *Troy* Ounce; which I suppose was introduced by the *Normans*, because it takes its Name ⁽²⁾ from a *French* Town, *Troyes* in *Champaigne*.’ Most Authors ⁽³⁾ have been of this Opinion.

(1) See p. 11, 103, 107.

(2) Bishop *Hooper*, p. 432, of another Opinion as to the Derivation of the Name.

(3) See *Hooper's Inquiry*, p. 10, 14, 92. and *Arbuthnot's Tables explain'd*, p. 16, and 283.

Opinion. This leads me to compare our *English Foot* with the *Roman Foot*, which Mr. *Greaves* takes as equal to 967 such Parts, as ours is 1000. The *Roman Amphora* or *Quadrantal* is generally allowed ⁽¹⁾ to be equal to a *cubic Roman Foot*; and to contain 80 Pounds, or 960 Ounces. Then the Side of the *Amphora* is equal to ⁽²⁾ 986 Parts of the *English Foot*; agreeing exactly with the Foot deduced by *Villalpandus* from the *Congius* of *Vespasian*; and a cubic Vessel, whose Sides are equal to 967 Parts of the *English Foot*, will not contain ⁽³⁾ quite 904 $\frac{1}{4}$ Ounces; which, if true, reduces the *Roman Ounce* to near 412 $\frac{1}{2}$ Grains *Troy*.

(1) See Bishop *Hooper*, p. 152, 175. *Greaves's Misf. Works*, p. 198, 199, 297, 303.

(2) For the cube Root of 960 is 986,1. And

(3) The Cube of 967 is but 904,231063. And Mr. *Greaves* himself says, an *Amphora* made by the *Pes Colotianus* held only 7 $\frac{1}{2}$ *Congii*, equal to 900 *Roman Ounces*; which comes as near the Cube of 967, as can be expected from the uncertain Method he took to determine the Contents of that *Amphora*, which was by filling it with 7 *Congii*, and, as he guessed, about an half, of *Milium*. See his *Miscellaneous Works*; (1737) p. 225.

The Table of	Busbels in	Gallons in	Pints in	Weight of the Gallon in <i>Avoirdupois</i> Pounds.
By the Coal Act	2217,47	277,183	34,648	10,025
By the Malt Act	2150,42	268,8	33,6	9,722
<i>Winchester</i> Bushel	2145,6	268,2	33,525	9,6
From, the Wine Gallon	1848	231	28,875	8,354
The Guildhall Gallon	1792	224	28	8,101
16 Oz. <i>Avoirdupois</i>	1769,472	221,184	27,648	8
12 Oz. <i>Troy</i>	1456,0224	182,0028	22,75035	6,5826
The following are not supported by any Law or Authority:				
(1) The vulgar dry Meal.	2178 †	272,25	34,0625	9,8468
(2) The Ale Measure	2256	282	35,25	10,1995

(1) Dr. *Arbuthnot* gives a *Table* of the *vulgar dry Measure*, as the Contents of the *Winchester* Measure. And he had so little Regard for the *Avoirdupois* Weight, that he does not give any *Table* thereof.

(2) The *Ale* Measure even exceeds the *Coal* Measure. And the Excess of the *Ale* Measure above the *Winchester* is more than one in 20 of the last Measure.

(†) See the Note (1) p. 60.

XVI. *A Letter from Dr. le Cat F. R. S. to C. Mortimer M. D. Secret. R. S. concerning the Cure of Dry Gangrenes: together with a Description of a new-invented Instrument for the Extirpation of Tumours out of the Reach of the Surgeon's Fingers.*

Translated from the French by Ph. H. Zollman Esq; F. R. S.

S I R,

Read March 9 and 16.
1748 9.

FOR some Years past, in curing the dry Gangrene, I have made some Progress, of which I think I ought to inform the *Royal Society*.

From the Year 1725 to the Year 1733, when I frequented the Hospitals of *Paris*, I saw that a great many Persons there died of a dry Gangrene, and even that nothing was done to them. I knew that Amputation had been attempted in vain; but I did not see any of the Practitioners endeavour to cure that Distemper by Remedies; nor did I think that Cure impossible. I suspected, that the Cause of the dry Gangrene was the want of a Flow of the arterial Blood and of the Spirits into the Part affected: And this Want, as it accounts for the Deadness, which cannot miss befalling the Part, and the Dryness which attends this sort of Mortification; whereas in the humid Gangrene, it is chiefly the Return of the Blood which is hindered, and thereby the Fluids are accumulated, that swell and distend the Part.

Two Causes so opposite must demand also very different Cures. The Distension which characterizes the humid Gangrene shews the Necessity there is for
Scarifications

Scarifications and Evacuations; as the Dryness of the other Gangrene points out the Uselessness of these Operations in this sort.

In the humid Gangrene the Solids are choaked up, and overflowed with the accumulated Liquid; the Nerves are there stupefied and benumbed: What can be more proper then after Scarifications, which disgorge and relax those Regions, than to apply stimulating *Topics*? *Tonics*, which restore the Spring, the Tone of the solid Parts; help them to expel those superfluous Liquors, the Spirits of which are as it were drowned and suffocated; and in short the Defect being local, if those Succours do not suffice, it is very common to cut off a Limb; the Loss of which may bring on that of the whole Person.

On the contrary, in the dry Gangrene the Solids are void of Fluids of all sorts. The neighbouring Regions, which begin to share of that Want, are affected with the most cruel Pains: If you attack those Parts with the cutting Instrument, you increase the Irritation of the Solids, the Constriction of the Vessels, the Want of Fluids, the Exsiccation, and hasten Death.

On the contrary, the general Indication, which this Distemper affords us is therefore to soften, to relax the Vessels, to draw thither the Liquors by *Topics*, whilst inwardly all Remedies must be given that are capable of bringing the Blood and the Spirits from the Center to the Circumference.

If this Method is not successful, Death is inevitable; for even supposing that the Amputation was not liable to the dismal Consequences just now specified, there is no Room for this Operation in an internal Defect, which depends on the whole

Habit, as the Case is with the dry Gangrene. And supposing that there are dry Gangrenes purely local, as the critical *Depositu*ms of certain malignant Fevers, you may assure yourself, that the very same Nature which has caused this Crisis, if you assist her but a little, will be able also to separate this Mortification from the sound Parts; and she will do it more gently and more dextrously than we.

These were the Notions I had formed to myself of these two sorts of Gangrenes; I only waited for Opportunities to make the Trials which this Theory suggested to me.

I did not find any before 1738. in the Person of a Wood-Merchant of our Town, called Mrs. *Fournaise*. She was then 65 Years of Age, extremely corpulent; the Gangrene seized her at the Heel, by a black and round Blotch, of two Inches Diameter, without any Tumour, with some small scorbutic Spots, great Pains, and a little Fever.

The *Plethora* made me begin with Bleeding and Purging; the latter I repeated every 8 Days.

I applied all over the Foot and Part of the Leg, a Pultis made of Herbs and *Farina's*, emollient, resolving, and aromatic, the suppurative Ointment, and *Storax*.

I gave inwardly diaphoretic Ptisans: In the Morning, Broths of Vipers, of Crayfish prepared with proper Herbs, and above all with Water-cresses: In the Evening a Bolus of *Theriaca*. In short, I followed intirely the Theory I had formed to myself about the dry Gangrene, and in 9 or 10 Days I saw the Suppuration formed; so that my Patient was perfectly cured in about 2 or 3 Months.

This

This Success has been followed by many others, both in our Town and in our Hospital. I have been particularly successful in the latter Place, because I am more Master there than any-where else, to see my Method exactly followed, which I have still improved since 1738.

The Report of these Cures having spread itself as far as *Paris*, I was sent for thither in *February* 1746. to attend M. *Rondé*, Treasurer-General of the Fortifications of *France*, who was at the last Extremity, by a dry Gangrene, which had sphacclated his Foot; the Cause of which had kept him in a languishing Way for 4 Years. M. *Rondé* was in a dreadful Condition, and I was vexed at having been sent for in so desperate a Case: I declared it to his Relations, and to the eminent Surgeons who attended him: I therefore applied my Remedies to the Patient, at the Request of his Relations, only by way of Trial, which I publicly declared to be most doubtful. However, contrary to our Expectation, from the 3d Day there appeared plainly a Beginning of Suppuration, and a Separation of the Eschars. On the 9th Day there was a complete Suppuration, and the Regeneration of the Flesh was even so far advanced, that the Singularity of it raised the Curiosity of some of the first Surgeons of *Paris*. At last, on the 15th Day my Patient found himself in a more favourable Crisis; which, according to the Testimony which M. *Morand*, an assiduous Spectator of my Cure, publicly gave of it, gave *Hopes of Recovery in a Case that had hitherto been thought desperate.*

The Suppuration, the Separation of the Eschars, and the Regeneration of the Flesh, being all that a Surgeon can desire in a like Cure, I then thought that my Mission was fulfilled, and that I might return home, whither I was called by more material Affairs. I had Reason to repent of this Journey : My Patient having naturally a very voracious Appetite, I had confined him to a severe Diet ; but he could hold out no longer ; and, by the Connivance of his Nurse, he took various Food, and that plentifully too. This Conduct had soon ruined our Progress. I returned to *Paris* ; my Representations were useless : The Patient had shaken off the Yoke of the Faculty, and of Reason. Indigestions ensued one upon another. The Looseness, which never left him after, totally suppressed the Suppuration, and made him void the Matter quite crude by Stool, and at last he died.

I was scarcely returned to *Rouen*, when there came to my Hospital a Patient seized with the dry Gangrene, and who so perfectly resembled M. *Rondé*, that we commonly called him *the Ronde of Rouen*.

This Cure being extremely interesting in all its Circumstances, I think, Sir, it is fit to transcribe for you the Observation taken from a Letter which I wrote on the 28th of *November 1746*. to M. *Morand*, and which he has since made public.

“ As this Letter has been made public by Mr. *Morand*,
 “ I shall not fill up this *Transaction* with a Trans-
 “ lation of a long Letter ; already in Print, but
 “ only give a short Account of the Case.

C. M.”
Thomas

Thomas le Monnier, a Carpenter, aged 66, was, in *December 1744*. seized with violent Pains in his right Foot resembling those of the Gout, but without swelling, and not preceded by any Sickness. He had work'd hard at his Trade, and still carried it on in marshy Places, and in bad and cold Weather, when he was seized with this Pain. He took various Remedies to no Effect. In *November 1745*. his great Toe turned black; which Blackness gradually spread to the other Toes, to the whole Foot, and at last to the Ankle. He was sent to the *Hôtel Dieu* at *Roan* *May 19*. His Foot was intirely gangrened, black and dry; his Pulse was low, and a little feverish; he never slept but 2 Hours a Night, suffered cruel Torments, was greatly emaciated, and of a yellow and leadish Complexion; his other Foot was oedematous. ‘*M. le Cat* says, he would not attack this Case Steel in Hand, by Scarifications or Amputation; cruel and murdering Methods! which quite extinguish the Springs of Life in the nervous System, which is already but too much ruffled. A barbarous Surgery! which Prejudice, Ignorance, and Unskilfulness alone can adopt, and by which I have seen Patients die, when there were great Hopes of their Recovery.’ See *le Dran’s* Operations, p. 30. *Saviard’s* Observations, p. 98. and *de la Motte* Obs. 303. especially p. 371. *Tome III*.

As this Disorder arises from internal Causes, its Cure is chiefly to be attempted by internal Remedies; and of these I give Cordials, Diaphoretics, and such as are capable of reviving the drooping Spirits, and of quickening the Circulation even to the Extremities:

To

To which should be joined Medicines adapted to the particular Habit of each Patient, whether it be scorbutic, scrophulous, or any other, which may have contributed to have brought on this particular Species of Gangrene: At the same time emollient, attractive, external Remedies, moderately warmed with Spices, applied to the Part, concur to the same Intention, by facilitating the Flow of Blood and Spirits; the Interception of which makes the distinguishing Characteristic of the dry Gangrene. Spirituous and aqueous Topics, impregnated with Volatiles, charged with saline, active, violently stimulating Particles, and others in Use in ordinary Gangrenes, are to be avoided like deadly Poisons; for such Applications would rather contract and dry up the Part the more, and increase the painful Irritations, and dispose the contiguous Parts to a dry Gangrene. He gives us Hopes of a Treatise expressly on this Subject.

But to return to the Case. The Suppuration began to appear, and the *Eschars* distinguished themselves from the live Flesh the very first Days of the Cure; and, after the Time usual in the like Suppurations, the Foot and lower Part of the Ankle separated of themselves; and afterwards, healing over intirely, left a Stump quite cover'd over with a Covering of Flesh, except some Points of Bone, which were not easily to be seen, but might be felt, by passing the Finger over this new Flesh.

After this Separation the Tendons of the Muscles, which lie along the Leg, formed Abscesses and *Sinus's*. Some Practitioners would have laid open these *Sinus's* their whole Length; but such large
Incisions

Incisions would have so affected the System of the Nerves, as to have brought back the gangrenous Disposition into the internal Parts, and so have destroy'd the Patient; as *M. le Cut* says he has seen it very lately happen by the like Practice: Wherefore he lets the Matter gather in those *Sinus's*, till it forms a Bag, and greatly thins the Skin, when he opens them almost without Pain, in the Place only where they point. These Openings are sufficient both for the Discharge of the Matter, and for the coming away of the Tendons; which no sooner happens, but the Integuments, whether open'd or not, unite and cicatrize. Thus, at the End of 6 or 7 Months, the Stump itself cicatrized, and the Patient was quite recover'd.

So long a Cure could not but be liable to some Accidents: The Patient was one who would indulge in his Diet, and the Hospital is open for any one to come in and visit their Friends: He had several strong Accesses of an accidental Fever, and five or six violent Indigestions; one in *July* kept him insensible for 20 Hours, and was attended with a Defluxion on the Lungs, accompanied with such Expectora-tions as gave the worst Prognostications. These were Incidents which render'd his Recovery the more remarkable. He has pick'd up his Flesh, and promises to enjoy a good Habit of Body; so that probably he may live to a good old Age. Several that have been cured by the Doctor, of this Disorder have lived to upwards of 70.

Thus, says he, the common Opinion, that it is impossible radically to cure the dry Gangrene, is as false, as the ordinary Method of treating it is bad.

He

He does not establish his Method as infallible; but assures us, that, in 8 or 9 Years Practice it has not failed curing any Persons who exactly followed it, and observed the Regimen prescribed.

“We now return to Dr. *le Cat*’s own Words.”

I shall here subjoin the Description of an Instrument of Surgery, which I have lately invented.

Forceps for the Extirpation of Tumours too remote from the Surgeon’s Fingers.

When the Fingers can lay hold of an Excrescency, the Surgeon need not think of making use of Machines for it; he will never find any convenient enough; but all Tumours that are to be extirpated are not within the Reach of the Fingers: There are even many of them which the Fingers can reach, but where they cannot lay hold of them, nor work as the Extirpation requires. Such are the Excrescences situated a little deep in the *Anus*, in the *Vagina*, in the Throat, &c. For the like Extirpations I have been obliged to invent the *Forceps* which I am going to describe.

Fig. 1. The first Figure represents the *Forceps* shut, as they are when the Instrument is closed, or when it holds a small Excrescency.

AC is the Extremity designed for laying hold of the Excrescency: It is of Silver, pliant as far as *aa*, in order to be able to give to these Checks the different Figures which those of the Tumours to be extirpated may require. The Inside of these Branches

Fig. 1. *p 80.*

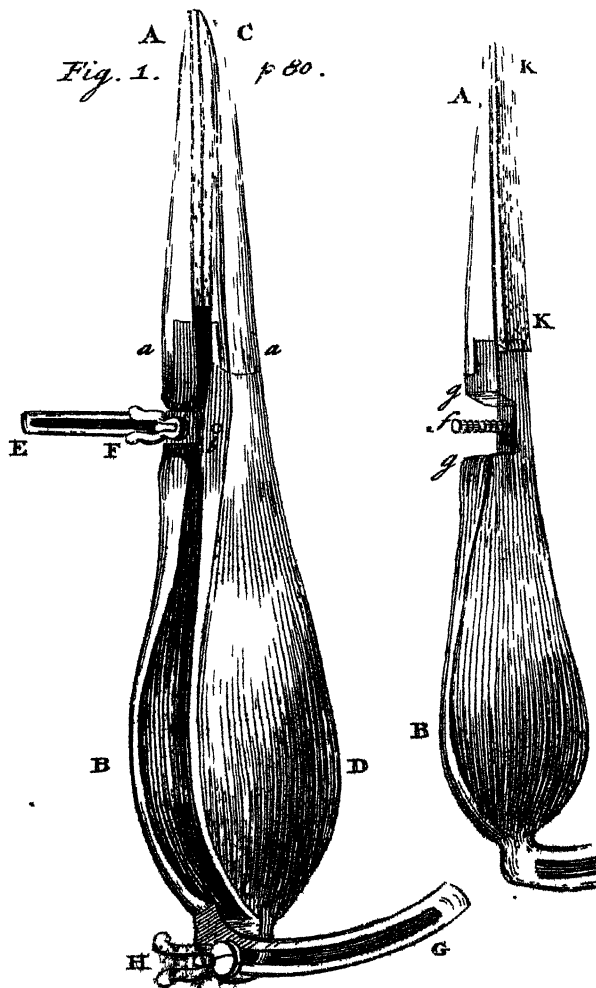




Fig. 2.
p. 81.

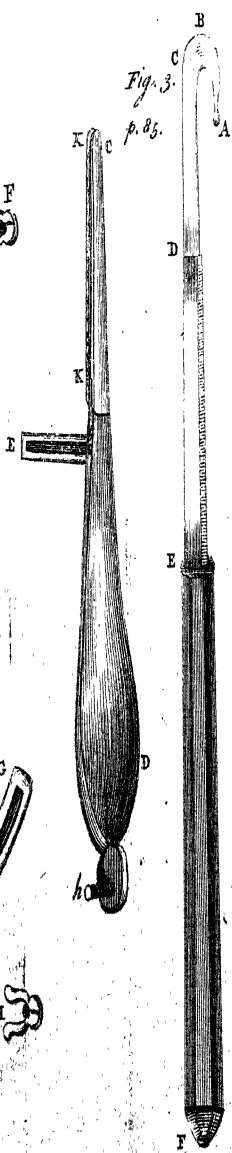


Fig. 4.
p. 85.



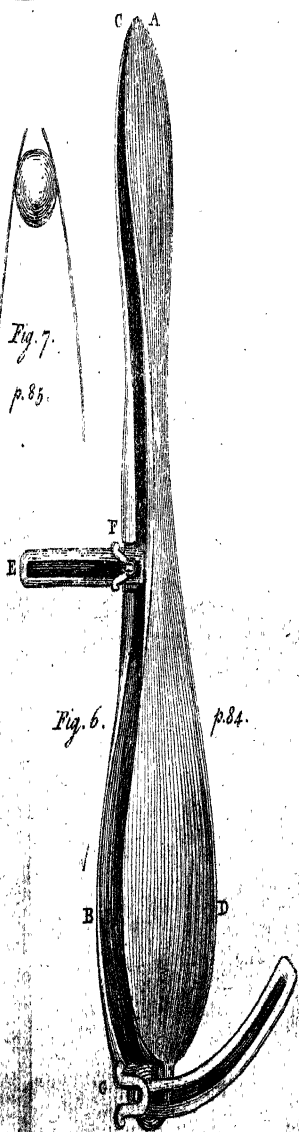
Fig. 5.
p. 85.



Fig. 7.
p. 85.



Fig. 6.
p. 84.



is lined with a Slip of Buff-Skin, or close Shamoy's (KK, *Fig. 2.* TAB. III.) to prevent the Tumour's slipping when once it has been laid hold of.

BD is the Extremity of the *Forceps*, to be held in the Hand of the Operator.

EF, GH, are the Pieces which connect the two Parts of the Instrument, instead of the common Joints or Rivets of the other *Forceps*, in a very advantageous manner. These Pieces make the principal Utility of this Invention.

Fig. 2. TAB. III. represents the Pincers taken to pieces in two Parts.

One easily sees that the Piece *E* is to go into the Notch *gg*, so that the Screw *f* may pass through its Slit, and that the Nut *F*, put on upon that Screw *f*, is to keep the Whole together: But one thing which the Figure cannot shew, is, that this Piece *E* is moveable in the Direction lengthways of the *Forceps*, to answer the different Openings of the Cheeks. You may observe in *b* the Pin upon which this Piece turns.

The Piece *G* likewise receives the Screw *b* into its Slit; and the one and the other is stopped by the Nut *H*. But an essential Remark with regard to the Piece *G*, is, that it must have the Figure of an Arch of a Circle, the *Radius* whereof is the Instrument itself; that is to say, it ought to be the Portion of an Arch of a Circle, the Center of which is at the Extremity of the Instrument; and this to the end that in the small Extremity of the Pincers, the Ends of the Cheeks find themselves over-against each other, whatever Opening one may give to the larger Extremity, or to the Handle *GH*.

To explain the Use of these *Forceps* :

I suppose I am to extirpate an Excreſcence, a *Condyloma*, of two Inches Depth in the *Rectum*. I cannot lay hold of this Tumour with the Fingers, nor make it come out ; yet it is very troubleſome to the Patient, and one is diſpoſed to ſlit or lay open the *Anus*, to make room for this Extirpation. With our *Forceps* we ſhall avoid this cruel Preparative, and ſhall with great Eaſe make the Extirpation.

Fiſt, I introduce the Fore-finger of the left Hand into the *Rectum* over the Tumour that is to be extirpated, to make myſelf ſure of the Situation : With the right Hand I take the Part of my *Forceps* *CD*, *Fig. 2.* and thruſt it into the *Rectum*, under the Finger which is already there, and make it ſlide along the right Side of the Tumour, which to me is the left Side.

With the Fingers of the left Hand I ſupport this Inſtrument in its Situation, whiſt with the right Hand I introduce the other Part of the *Forceps* *AB*, *Fig. 2.* and let it ſlide along the left Side of the Tumour, which is over-againſt my right Hand.

Without taking the Fore-finger of my left Hand out of the *Rectum*, I put together the Parts of the Inſtrument. I preſs between its Cheeks the Tumour by its Root ; after which I draw the Fore-finger out of the *Rectum*. I take with the left Hand the Handle of the *Forceps* *BD*, *Fig. 1.* ; I thruſt along the right Side of their Cheeks underneath the Knife *Fig. 3.* the Button *A* being turned againſt the Cheeks, and the Back *CD* towards the Inſide of the *Rectum*.

I puſh this Inſtrument as far as beyond the Tumour under the Extremitſy of the Cheeks of the *Forceps*,
of

of which I can make myself sure with the Forefinger of the left Hand. — Then I raise towards the upper Part the Cheeks of the *Forceps*, in order to prolong as much as possible the Root of the Excrescence; and in this Condition I pull towards myself, with the right Hand, the Knife; which does not fail cutting the Tumour.

There are Cases, in which the Instrument, *Fig. 4.* will be of more convenient Use. This cuts only by its Crescent *ab*, push'd forward, and mov'd alternately from one Side to the other, to assist its Cutting.

There are Circumstances, wherein the Knife *Fig. 5.* may be preferable.

In fine, there are others, wherein all these Instruments are of Service in one Operation, which happen'd to me in *October 1748.* in the Extirpation of a scirrhous *Polypus* in our *Hôtel Dieu*; in which Operation I employ'd not only all the Instruments above described, but also a cutting *Forceps*, which I had contriv'd in 1735. for the Extirpation of *Fungus's* of the Bladder; and which alone was proper to take off one Part of this Tumour, that was as large as a Goose's Egg, and was falling into the Throat.

I suffer the Wound to bleed a little, and then dress it with all the Precautions usually taken against Hæmorrhages in the Operation of the *Fistula* in the *Anus*.

Forceps for extracting Stones; and other foreign Bodies, lodged in the Parts where the common Forceps are of no Use. Fig. 6. TAB. III.

The same Mechanism just now described in the foregoing *Forceps*, may be applied with Advantage to the *Forceps* with which the Stone is pulled out, and to other Instruments designed for extracting Bullets, Splinters of Grenadoes, Pieces of Iron, and other foreign Bodies.

There are several Cases in the cutting for the Stone, in which no Use can be made of the common *Forceps*: The most frequent is this; when a Stone, laid hold by the ordinary *Forceps*, escapes from the Instrument half-way, and so remains engaged in the Incision. The Expedient commonly taken, is to push the Stone back into the Bladder, in order to have again the necessary Room for managing the *Forceps*; But besides the cruel Pain in thus pushing back the Stone into the Bladder, this foreign Body may enter into the cellular Texture which surrounds the Bladder, and lodge itself there, and then the *Forceps* not having any longer that Play which was endeavoured to procure to them, the Stone will remain in that fatal Lodgement, without Possibility of pulling it out, and the Patient will die. This has been seen many times.

The Stone having stopp'd in the Passage of the Incision, you slide along the Body of it one of the Cheeks of our *Forceps*, *A* or *C*, well-oiled, which will be done without much Trouble, as I have experienced it; the other Cheek afterwards will

pass on the other Side ; after which you join them, as has been shewn above, taking care to press close the Extremity *AC* upon the Stone, and to leave the largest Opening on the Side of the Handle *BD*, as in *Fig. 7.* both to hinder the Stone from escaping, and to widen its Passage ; then, having well-secured the Screw *G*, you leave the Screw *F* almost at Liberty. You grasp the Instrument with both Hands, as near the Stone as you can, and you draw that Body out, managing it as is usual with the common *Forceps*.

A second Case of cutting for the Stone, where these new *Forceps* will be of great Use, is this ; when the Stone is exactly embraced by the internal Coat of the Bladder ; be it that it completely fills this whole Organ, or that it fills Part of it, which may have closed itself upon the Stone ; as has happen'd to *Joseph Bunel*, whom I cut at *Andelys* in 1743. of which I have communicated the Observation to the *Royal Society* ; or that the Stone has made to itself a Lodgement or Bed in the inside Coat of the Bladder, prolonging itself towards the cellular Texture, which surrounds a small Part of those inside Coats ; as I saw it in the Bladder of *M. Pigache*, an eminent Counsellor of our City of *Rouen*.

In short, every foreign Body lodged in the Substance of any Part of the human Body, be it of what Nature it will, becomes the Object of our Instrument ; and the Extraction of it will, in my Opinion, become much more easy by the means of these *Forceps*, than by the Bullet drawers, and most of the other Instruments invented for that Purpose ; provided however one gets *Forceps* made of all sorts
of

of all sorts of Lengths and Bigness, in short, of all the Shapes which the different Cases may require.

I have the Honour to be, &c.

Rouen, May 20.
1748. N. S.

———— Le Cat.

Addition to the Description of the Glasses for preserving things in Spirit of Wine, by Dr. le Cat, pag. 6.

In using the Bottle, of which I have given a Description, I found that it was attended with one Inconvenience,

The circular Groove, the Edge of which was turn'd up on the Inside of the Bottle, retained a small Quantity of the Water, when I emptied and rinsed it; so that it was impossible to do it thoroughly.

Wherefore I caused this Vessel to be made, as represented in the annexed Figure, TAB. I. *Fig. 1.* which is a Section of it; and where it appears that the Groove *AA* is placed on the Outside of the Edge of the Bottle. By this means every Drop of the contain'd Fluid can be pour'd out.

It is easy to see that the circular Border *BB* of the Cover is to enter into these Grooves *AA*, which are fill'd with Oil or Quicksilver; and that the Hook *C*, of the same Cover, is destined to suspend in the Liquor such Pieces as are to be preserved in it.

PHILOSOPHICAL TRANSACTIONS.

For the Months of *April, May, and June, 1749.*

- I. *Viæ Cometarum*, secundùm hypothesin quæ statuit illos cursu suo Parabolam circa Solem describere, per *Nicolaum Struijk*, R. S. Lond. S. p. 89
- II. Epistola à *Job. Jacobo Hubero* M. D. Med. & Consil. Reg. Suec. & Anatom. Prof. *Cassel.* ad *Cromwell Mortimerum* R. S. Secret. de *Cadavere aperto*, in quo non existit *Vesica fellea*; et de *Sterno gibboso*. p. 92
- III. *The Operation of Lithotomy on Women*, by *Mons. le Cat*, M. D. & F. R. S. Translated from the French, by *T. S. M. D. and F. R. S.* p. 97
- IV. *De Barometrorum cum Aëris et Tempestatum mutationibus consensu*: Auctore *Sam. Christiano Hollmanno*, Philos. in Acad. *Gottingensi* Profess. publ. ordin. et R. S. Lond. S. p. 101

The CONTENTS.

- V. *A Letter from Captain John Waddell, to Mr. Naphthali Franks Merchant, concerning the Effects of Lightning in destroying the Polarity of a Mariners Compass; to which are subjoined some Remarks thereon, by Gowin Knight, M.B. F.R.S.* p. 111
- VI. *A Letter from Sir Hans Sloane Baronet, late Pr. R. S. to Martin Folkes Esquire Pr. R. S. containing Accounts of the pretended Serpent-stone-called Pietra de Cobra de Cabelos, and of the Pietra de Mom-bazza or the Rhinoceros Bezoar, together with the Figure of a Rhinoceros with a double Horn, from a Coin of Domitian.* p. 118
- VII. *Same Account of the Rana Piscatrix; by James Parsons, M.D. F. R. S.* p. 126
- VIII. *Observations on the Height to which Rockets ascend; by Mr. Benjamin Robins F. R. S.* p. 131
- IX. *Extract of so much of Don Antonio De Ullöa's F. R. S. Account of his Voyage to South America, as relates to the Distemper called*

The CONTENTS.

- called there Vomito Prieto, or black Vomit.
Translated from the Spanish by W. Watfon
F. R. S. p. 134*
- X. *Declinationes quarundam Stellarum
Australium primæ et secundæ magnitudi-
nis, mense Junio 1738. cum methodo
inveniendi horam in mari noctu, ex aspectu
Crucis australis; per Dn. de la Condamine,
Reg. Societ. Londin. & Acad. Reg. Scient.
Parif. Socium. p. 139*
- XI. *A Letter from Mr. Emanuel da Costa
F. R. S. to the President, concerning two
beautiful Echinites. p. 143*
- XII. *The State of the Tides in Orkney; by
Mr. Murdoch Mackenzie. p. 149*
- XIII. *Some Account of the Remains of John
Tradescant's Garden at Lambeth; by Mr.
W. Watfon F. R. S. p. 160*
- XIV. *A Letter from the Rev. Mr. Richard
Dunthorne to the Reverend Mr. Richard
Mafon F. R. S. and Keeper of the Wood-
wardian Museum at Cambridge, concerning
the Acceleration of the Moon. p. 162*
- XV.

The CONTENTS.

XV. Alberti Halleri, *Archiatri Reg. Medicin. Prof. Gotting. & R. S. Lond. S. Fabricæ morbosæ in cadaveribus repertæ historię aliquæ.* p. 172

XVI. *A Memoire on the Lacrymæ Batavicæ, or Glass-Drops, the Tempering of Steel, and Effervescence, accounted for by the same Principle. By Claud. Nic. le Cat, M. D. F. R. S. &c. Translated from the French, by T. S. M. D.* p. 175

XVII. *Extract of a Letter from Mr, Prof: Geo. Matthias Bose, of Wittemberg, to Mr. W. Watfon, F. R. S. on the Electricity of Glass, that has been exposed to strong Fires.* p. 189

June 15. the SOCIETY adjourned to Oct. 26.
1749.

I. Viæ *Cometarum*, secundum hypothesin quæ statuit illos cursu suo Parabolam circa Solem describere, per *Nicolaum Struijck*, R. S. *Lond. S.*

Presl. April 6. 1749. **I**ndagationem cursus cometarum ex præcipuis astronomiæ sublimioris partibus esse, nemo hodie astronomorum in dubium vocaverit: postquam vir summus *Isaacus Newtonus* ante annos LXIII in lucem edidisset celebratum problema de via cometarum per tres observationes accuratas inveniendâ ex hypothesi, illos cursu suo parabolam circa solem describere, hac methodo usus *E. Hallejus* vias xxiv cometarum per calculum determinavit in tabella, quæ reperitur in *Transactionibus Philosophicis* N. 297. p. 1886. et in *Actis Eruditorum* anni 1707. p. 216. Revera autem sunt xxi cometæ diversi. Quanto labore id constiterit, docent ipsa *Halleji* verba, qui “ undique enim, inquit, conquiritis cometarum observationibus tabellam, immensi pene calculi fructum obtinui.” Non opus est ut demonstrem, quam necessaria sit ista tabella seculis venturis; sufficiat testimonium auctoris modo citati; “ Huic tabulæ adornandæ nullis pepercî laboribus, ut perfecta prodiret; utpote posteritati consecrata; ac cum scientia astronomica duratura.”

Tanti viri vestigio infecutus eadem methodo alios xviii cometas, qui in illa tabula non reperiuntur, undique conquiritos annotavi, eo consilio ut tandem singulorum tempus periodicum inveniri posset. Ne vero istæ observationes de viis cometarum casu aliquo

perirent, illas nunc in publicam lucem emittere decrevi, simul officii mei esse ratus indicare quanam illas calculo arithmetico accommodaverint. Via cometarum anno 1723, et 1737, per calculum determinata est a *J. Bradley*. via cometarum 1744, a *J. Bets.* via cometarum 1699, 1702, et 1739, ab *Abbate de la Caille*. via secundi cometæ 1793, a *D. Klinkenberg*; via secundi Cometæ anno 1796, a *des Chezeaux*; primi Cometæ anni 1798, a *Maraldi*. Cumque ipse tempore excluderer, observationes Cometarum conspensorum annis 1533, 1678, 1718, et 1729, cum *C. Downes* calculo subjiendas communicavi. Cometæ vero ann. 1706, 1707, 1742, primum anni 1743, et secundi anni 1748, ipse ad calculum revocavi: quin etiam haud variis rationibus ductus, existimo, ejusdem anni 1748, mense *Mai*, et hic *Amstelodami*, et aliis *Europæ* locis, simul et eadem nocte tres cometæ conspici potuisse; cujus rei in historiis nullum aliud indubitatum exemplum extat. Addidi etiam Cometam exitu anni 1680, et initio anni 1681 conspectum; quia in postrema *Is. Newtoni* editione emendationes leguntur, per quas ellipsis, quam circa solem movendo descripsit, determinatur.

Nunc etiam indicandum esset, quantum theoria singulorum Cometarum ab observationibus differat; sed brevitati studens hanc tractationem alii scripto, cujus editionem paro, servare malui, illud unice monens; ex xxxi observationibus, quas habeo, Cometæ ann. 1742, conspecti, esse xxii quarum longitudines vix unico minuto inter se differunt, et xxiii, quarum latitudines ne minuto quidem differunt.

Sequuntur viæ xix Cometarum, quorum supra facta est mentio.

Tempus

Tempus Aequationis Periheli Londini.				Nodus Afcent.			Inclinatio Orbitæ.			Perihelion in Orbe.			Diff. Perih a Sole.		Motus
An.	d	h	"	0	1	"	0	1	"	0	1	"	Part.	"	
1533 Junii	16	19	30	0	5	44	0	35	49	0	27	16	0	20280	Retro.
1678 Augusti	16	14	3	0	11	40	0	3	4	20	27	46	0	123802	Dir.
1699 Januarii	2	8	22	19	21	45	35	69	20	0	2	31	6	74400	Retro.
1702 Martii	2	14	12	19	9	25	15	4	30	0	18	41	3	64590	Dir.
1706 Januarii	19	4	56	0	13	11	23	55	14	5	12	36	25	42686½	Dir.
1707 Nov.	30	23	43	6	42	50	29	88	37	40	19	58	9	85904	Dir.
1718 Januarii	4	1	14	55	7	55	20	31	12	53	1	26	36	102565	Retro.
1723 Sept.	16	16	10	0	14	14	16	49	59	0	12	15	20	96942	Retro.
1729 Junii	12	6	35	91	10	35	15	77	1	58	22	16	53	906980	Dir.
1737 Januarii	19	8	20	0	16	22	0	18	20	45	25	55	0	22282½	Dir.
1739 Junii	6	9	59	49	27	15	14	55	42	44	12	38	40	67358	Retro.
1742 Januarii	28	4	20	50	5	34	45	67	4	11	7	33	44	76555½	Retro.
1742 Decemb.	30	21	15	16	8	10	48	2	15	50	2	58	4	83811½	Dir.
1743 Septemb.	9	21	16	18	5	16	25	45	48	21	6	33	52	52157	Retro.
1744 Februarii	19	8	27	0	15	45	20	47	8	36	17	12	55	22206½	Dir.
1747 Februarii	17	11	44	38	26	58	27	77	56	35	10	5	41	229388	Retro.
1748 Aprilis	17	19	25	4	22	52	16	85	26	57	5	0	50	84066½	Retro.
1748 Junii	7	1	24	15	4	39	43	56	59	3	6	9	24	65524½	Dir.
1680 Decemb.	7	23	9	0	2	2	0	61	6	48	22	44	25	617	Dir.

Distantiæ autem Periheliæ æstimantur in ejusmodi partibus, quales mediæ distantie terræ a sole habet centies mil'enas.

II. Epistola à *Job. Jacobo Hubero* M. D. ad *Cromwell Mortimerum* R. S. Secret. de *Cadavere aperto*, in quo non extitit *Vesica fellea*; et de *Sterno gibbofo*.

Read April 6
1749.

NON sine aliquo literario munusculo ad te celeberr. *Mortimere*, adire fas est, virum humanissimum quidem, sed eundem etiam talium rerum avidissimum, quibus aliqua pars illius cognitionis contineatur, in qua augenda et publicanda illustrissima Societas, cujus tibi acta commissa sunt, elaborare solet. Superest, ut hic aliquid invenias ab illo instituto non abhorrens. Volui certe aliquem tibi gustum quasi dare, quid, præter scopum primarium, fabricam corporis humani docendam Medicinæ, Chirurgiæ præsertim studiosos, spectare in quotidianis cadaverum humanorum sectionibus, in *Theatro Collegii* apud nos *Carolini* institutis, consueverim, et cujus generis observationes expectari porro, ut in rebus humanis, a me possint.

Observationes autem e pluribus duas hic speciminis et gustus causa breviter describam, unam quæ vitiatam, eoque ipso singularem sistit partis corporis humani structuram, simulque usum arti salutari præstare nonnul-um videtur; alteram, quæ œconomix corporis nostri singularem præbet mechanisum, quo etiam physiologorum discrepantes de bile cystica sententiæ

tentiæ conciliari forte poterant. Hepar hæc exhibet, vesiculæ felleæ penitus expers.

FEMINÆ cadaver erat, sexaginta circiter annorum, demonstrationibus anatomicis interiturum, proximo anno in auditorium *Carolinum* inter plura alia, in quo reperi magnum valde hepar, et præter morem crassum; sed lobum ejus dextrum parte concava omni carentem. Nullum nec sulci nec excavationis pro recipienda vesicula fellea offerebatur vestigium, sed universus lobus ille erat ab utraque parte, tam quæ intestina attingit, quam ab alia, quæ diaphragmati se accommodat, lævis, æqualis, atque in primis tumidus, utrimque convexus atque eminent, et quasi rotundus. Uti in hoc lobo, ita et in omni alia hepatis parte vesiculam felleam frustra quæsi: nec quidquam vicinæ partes referebant cum vesicula comparandum, aut condibilis secundarii vices defungens; contra pro more partes reliquas omnes vidi formatas. Iste vero vesiculæ defectus ductus hepatici amplitudine, præter omnem consuetudinem magna, refarciri videbatur, quæ digitum minimum admitterbat. Ille quamvis julto, et suo loco constitutus, ordinariaque via incedens, in eo tamen erat structuræ singularis, quod tunica crassitie sua arterialium tunicis fere esset æqualis: non illa tamen alba, sed tota quanta sublutea, intus villosa, ex pustulis seu exilibus maculis, totidem, puto, folliculos simplices referentibus, non paucis notata. Ab hepate adusque duodenum eandem servabat ductus ille diametrum, licque cum vena portarum fere confundebatur: ubi vero duodeni tunicas attigerat, easque subierat, seposuit mox nimiam illam amplitudinem, et consuetæ papillæ, in duodeni cavo eminentis ministerio suam quæsiit,

quæsit, et per omnem mulieris vitam, puto, habuit exonerationem. Pori in hepate biliarii, seu rami ductus illius magni conspiciebantur plures, ab utroque lobo confluentes, arteriarum in morem ampli valde, et ad ultimam fere hepatis peripheriam facile prosequendi, extus lutei omnes intus bile infarcti. Amarum sat continebant bilem, nec copia paucam ductus omnes, et præsertim magnus ille, extra hepar formatus. Illam ductus amplitudinem condi seu vesiculæ fellæ loco fuisse, arbitror, et illius usus, uti in eo in immensum distento bilis, in hepate secreta, nec omnis statim excernenda immorari commode posset, et ibidem mora sua reddi acrior; atque tunc demum, quando verum digestionis tempus ingruerat, evacuari copia et acrimonia præstantior. Præstare ut potuerit hæc ductuum amplitudo condi officium, adjuvabant porro folliculi simplices, per omnem ductus magni tunicam intus dispersi, blandum pro natura sua effundentes humorem, quo universus ductus ab acrimonia remanentis bilis defenderetur, sicque ibidem ad justum majoris evacuationis tempus servari superflua commode posset. Similem itaque structuram referebant ductus illi ampliores, qualis vesiculæ fellæ ordinario esse solet.

Hoc exemplum, rarissimum quamvis de novo me declinat ab eorum physiologorum sententia, qua vel vesiculæ tribuitur structura propria, ad secernendam bilem suam apta, vel ductus assumuntur cyst-hepatici vel hepatico-cystici, et ita simplicis condi officium denuo adscribo vesiculæ fellæ, quod in dissertatione mea inaugurali jam monui?

Ob argumenti affinitatem hoc insuper hic addam; vidisse me Argentorati ante hos xv annos in recenti cadavere

cadavere humano ductum cysticum atque cho'odochum ita distentos, qui facile admitterent digirum. Calculis vero debebatur valida illa amplificatio haud paucis, in vesicula generatis. Aliquot eorum in ductu adhuc hærebant, nucis avellanæ magnitudinem æquant, molles tamen, et ductus se aliquo modo accommodantes. Erat autem ductus hepaticus de more constitutus.

ALTERA quam tecum, clarissime *Mortimere*, et si ita videatur, cum omnibus communicare placet, observatio de gibbofo sterni agit, ab externa demum vi et incauta tractatione, non ab ipsa natura deformi configuratione producta. Non unica sed repetitis in diversis cadaverculis observationibus pectus perspexi præter omnem consuetudinem configuratum. Præ reliquis deforme erat pectus infantis octo hebdomadum, sequentem in modum : valde prominebat os pectoris gibbosum, quod ita a lateribus erat pressum, uti vix recederet a sellæ equinæ figura. Costarum supremarum duabus vel tribus exceptis, partes anteriores intropressæ conspiciebantur intra pectus ab utroque latere, plures tamen sinistri lateris quam dextri, ubi debiles sunt valde atque molles, et cum cartilaginibus sterni committuntur. Et in primis cartilagines excavatam extus referebant figuram. Atque ita fere diffractæ adparebant costarum aliquot. Una tamen præ altera exilibus intervallis erat magis intropressa. Aperto demum pectore plures vidi costas, cavum pectoris versus gibbosas; quarum cartilagines ruberculis suis quasi nodo æfactæ erant, ideoque non parum contulerunt ad angustandum præter morem pectoris cavum. Unde facile erit cuique ad intelligendam
infantum

infantum phthisin, qua miseri illi ita deformati vitam amiserunt. Id porro pulmones, pleuræ circumcirca adnati atque infarci, quales tunc reperi, satis confirmant. Cogitando inquirens in magni vitii hujus, aliquoties jam in dissecandis infantibus a me observati, et quod in vivis etiam animadverti, causam, et sedulo contemplando pectus hocce deforme, atque comparando illud cum annotationibus meis, ex aliorum cadaverculorum similem in modum vitiatorum sectionibus desumptis, in veram tandem tantæ deformitatis et tam noxiæ causam incidi. Infantum scilicet curatricibus omnem hanc culpam, aio, esse adscribendam. Non satis enim cognita est iis structura tenellorum corpusculorum plastica: nec debite perpendent lusus omnes, quibus vel placare morosulos, aut gesticulatione vel saltatione exhilarare vivaciores infantulos conantur, unde diversas excogitant tractationes. Noxia præ aliis ea est, quando sinistræ manui suæ nates infantis imponunt, et antrorsum ita inclinatum paulum in aëtis truncum dextra sua, pectori applicata, expansis digitis sustinent, atque ita subinde miserum corpusculum in altum tollunt, atque deorsum labens illud pondus omne manu sustinent dextra. Eo enim haud raro fit, uti suffultæ manus vestigia tenello pectori, et vi facile cedenti imprimantur. Antequam in dictam mox deformitatis illius causam inciderem, ad costarum foveas aliquot distinctas non attendi. Jam vero rite perpenſis omnibus certo comperi, esse illas depressiones seu foveas quinque curatricis, seu magis deformatricis, digitorum vestigia, pectori infantis tandem impressa. Mea enim applicata pectori infantis manus dextra diductis paucillum digitis exactè respondebat depressionibus illis: quarum

quatuor

quatuor erant in sinistro pectore pro digitis, quinta vero eademque maxima dextrum deformabat pectus, pollicem recipiens. Quam itaque perversus sit ille, et detestandus tenellos infantes tractandi mos, satis ille frequens, ex supra dictis facile patebit, spero, cuique. Si vero ad illos perveniat hæc observatio, quod valde optarem, qui infantum curas gerunt, plures, puto, a vitio illo immunes præstari in posterum poterunt homines, ne prima ætate male tractati hoc vel alio modo non minus cauto, vel defigurentur; vel et tabe, vel alio morbo inde orto consumantur. Simillimam narratæ observationem feci nupera hyeme in puella duorum annorum. Et uti jam monui in vivis etiam corporibus animadverti similia. Cum *Rachitide* cæteroquin minime confundenda est deformitas ista.

Dabam Cassellis Jan. 31.
1747.

Joh. Jac. Huber.

III. *The Operation of Lithotomy on Women,* *by Monsr. le Cat. M.D. & F.R.S.*

Translated from the French by T. S.

Read April 6. 1749. **T**HE lateral Way of cutting for the Stone, which I have used on Men since 1732, naturally led me, in the Year 1735, to cut the Widow *Neel*, a Farmer near *Tvetot* in the *Pais de Caux* in the same manner, as has been seen in the Observation. In this Operation the common grooved Staff served me as a Director; and having
N made

made the Incision, on the left Side of the *Urethra*, with the strait grooved Knife, which I used that Year in cutting Men, I withdrew the grooved Staff, and introduced the Groove of the Knife.

Immediately after this Operation, I shorten'd the Work, by reducing the three Instruments to two. For that Purpose I contrived to add to the common Gorget *AA*, Fig. 1. and 2. TAB. I. a grooved Staff *BB*.

After placing and tying the Patient in the same manner as for cutting Men, I at once introduce into the *Urethra* the End *B* of the Gorget, which constitutes the grooved Staff, I turn the Groove towards the Patient's left Buttock: On this Groove I push the Knife (*Urethro-cistitome*) Fig. 3. which is not grooved, nor so broad as that which I made use of in 1735 on the Widow *Nel*. Having laid open the Neck of the Bladder, I lay aside the Knife, and thrust the Gorget farther into the Bladder; for Example, as far as *C*. Then I pass the Fore-finger on the Gorget into the Bladder, to dilate the Neck; which done, I introduce the Gorget as far forward as is necessary, and on it the *Forceps*. The rest of the Operation is performed as on Men.

The first of the Sex, whom I cut in this last Method, as appears by my Journal, is *Magdalen le Marchand* of the *Pais de Caux*, aged 22, cut in May 1738. I extracted a large Stone from her, and she was cured in ten Days.

Since that time I have constantly practised this Method, which has succeeded perfectly well. When the Stones were little, the Patients were cured in a few Days: But here is one, whose speedy Cure has somewhat surprising in it; inasmuch as I really believe it the only one which has happen'd so.

Mary

Mary le Comte of *Diepdal* near *Rouen*, aged 12, cut the 24th of *May* 1740, had a Stone of a middling Size. In three Hours she retain'd her Urine, so as not to discharge it but voluntarily. I thought it was the pretty common Effect of the inflammatory Swelling, which frequently happens after the Operation; and that the Suppuration would soon relax these Parts, and open the Wound; but I was mistaken. There was not the least Suppuration. *Mary le Comte* perform'd all the Functions of this Organ, as usual; and being tired of the Bed, to which she was confined against her Will, she got up the third Day, in good Health, without any Accident supervening.

At the same time that I was labouring to improve the Manner of cutting Women, and shorten the Operation, I contriv'd another Gorget (*Fig. 4.*) which, besides the grooved Staff of the former, contain'd within it the cutting Instrument, which was to make the Incision or Enlargement, that is to say, the three Instruments in one: And this Instrument was attended with this Advantage, that it could serve for Men as well as Women. One Hand is sufficient to perform the Operation with this Instrument; but as the other Hand became in a manner useless; and moreover, as it is probable, that a Person can better depend on an Incision made directly with the Hand, than on those which are made by Machines or Springs. I have not hitherto used this Instrument; tho' possibly the Habit I had contracted of using the others has some Share herein. However that be, I have annexed the Figure and Description of this Gorget, that those who like it, may make use of it.

TAB. I. *Fig. 4.*

*Explanation of the Figure of the Gorget, which
Mr. le Cat calls Gorgeret Urethro-cistitome.*

A, A Ring, for passing the middle Finger of the right Hand, which grasps the Handle *G*.

B, Another Ring which is slid by the Fore-finger towards *d*, to push the Blade *ab*, out of the Groove *EF*. The Figure represents the Instrument in the State in which it is at the very Instant when the Incision is made into the Neck of the Bladder. The same Fore-finger draws the Piece *B* back towards *A*, when the Operator intends to make the Blades return into the Groove *F*; where they lie hid, while he introduces the Instrument from *D*, as far as *Ff* into the *Urethra*.

The Groove *FE* is closed or covered from *d* to *e*, in order to secure the Pieces *a, b, c, d, e*, in Situation.

The Pins, which bind the Hinges *a, b, c*, must not be in the Center of the Pieces, but as they are expressed in the Figure; where *b* is pretty near the outer Edge, and the other two *a, e*, on the opposite Side; to the end that, when the Ring *B* is thrust forward, the Hinge *b* may bend, and issue out of the Groove *F*, by making the Angle *abc*.

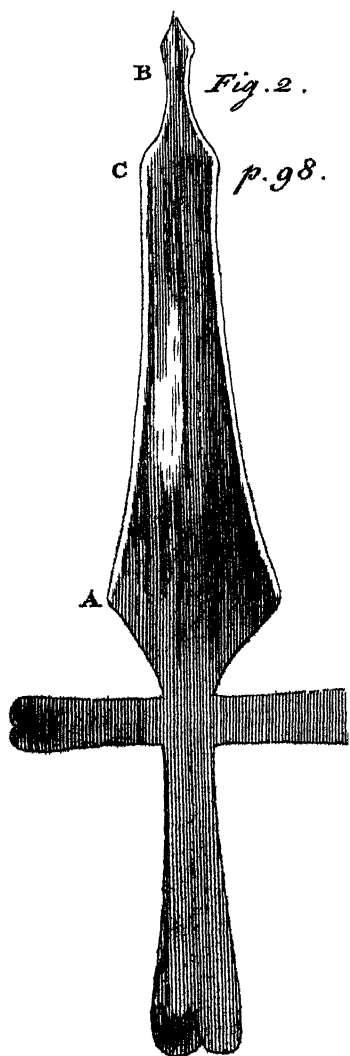
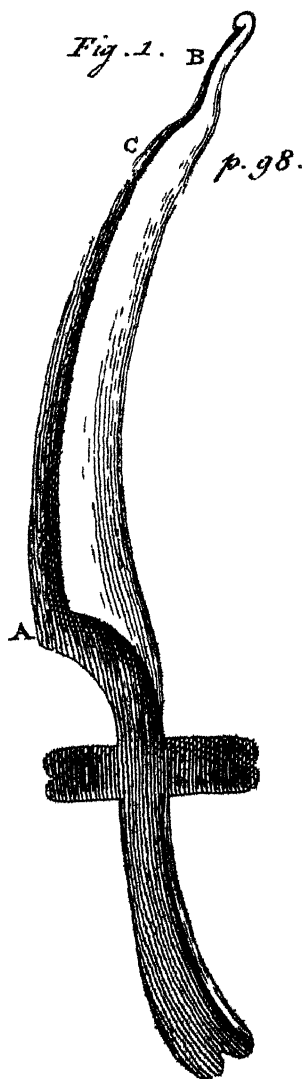




Fig. 3.
p. 98.

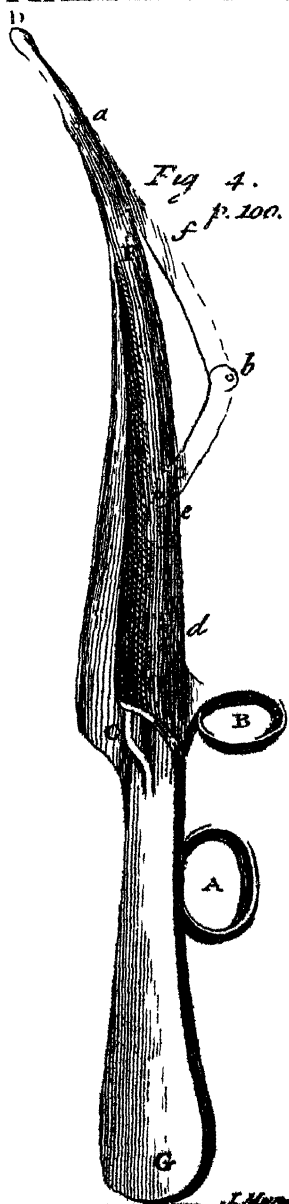


Fig. 4.
p. 100.

J. L. G. & Co.

IV. De *Barometrorum* cum *Aëris* et *Tempestatum* mutationibus consensu: Auctore *Sam. Christiano Hollmanno*, Philos. in *Acad. Gottingensi* Profefs. publ. ordin. et *R. S. Lond. S.*

Read April 23.
1749.

Difficultatis plena res adhuc visa est veram mutatæ mercurii barometrici altitudinis causam consensuque adeo cum subsequen-
tibus tempestatum mutationibus rationem et modum explicare. Neque omni difficultate rem carere tot præstantissimorum virorum adhuc excogitatæ hypo-
theses satis indicant. Inter has vero, quæ occasione controversiæ inter *Schellhamerum* et *Ramazzinum* ea de re exortæ, a *Leibnitio* excogitata, et publici
juris passim facta est, reliquis fere omnibus anteferri a multis cœpit. Ostensum vero jam in his præsentibus Transactionibus a doctissimo *Desaguliero* satis
est, legibus hydrostaticis *Leibnitianam* isthanc hypothesin adversari*: ut adeo mirum sit, a tot aliis ab
illo tempore eandem adhuc potuisse defendi; impri-
mis, quum et naturæ phænomenis eandem parum
convenire, fere in propatulo sit. Quodsi illa enim
causa descensus ascensusque mercurii in barometris
esset, quam *Leibnitius* allegavit; neque prius, aut
non multo saltem prius, mercurius posset descendere,
quam guttæ pluvix per incumbentem atmospheram
descendere cœpissent: neque prius iterum ille posset
ascendere, quam descendere illæ desiissent: quod
utrumque

* *Vide* N. 351. p. 570, et seq.

utrumque vero experientiæ omni reclamare, illis satis notum est qui ad mutationes barometricas vel per unum alterumve mensem solum attenderint. Non raro enim tribus quatuorve integris diebus mercurius sensim jam ante incipit descendere quam vel guttula ex aëre ambiente decidat; et ascendere iterum, etsi integros sæpe dies adhuc pluat. Imo mercurius in baroscopiis sæpe quoque *descendit*, licet *nulla* plane insequatur pluvia. Neque guttulæ cadentes pluviae in fine descensus sui *aërem succumbentem* ita premunt, quemadmodum pondus in experimento *Leibnitiano* per aquam descendens, *fundum vasis* sui, in quo descenderat; neque adeo eodem modo, ac hoc quidem vasi suspenso, *reddere* aëri *æquilibrium* suum amissum possunt. Adeo omnia in experimento *Leibnitiano* naturæ sunt difformia et dissona, ut anceps hæream, num magis *Leibnitii*, viri suo alias merito magni ingenium an cæcum potius affecularum assensum mirari debeam. Accedit circa ipsum experimentum causæ, quam vocant, *fallaciam a Leibnitio* esse commissam, quando mutati nempe æquilibrii illam esse existimavit, quod solida in fluido descendente, durante descensu suo in fluidum ambiens non gravitant. Experimentum enim tum omnium succedere optime deprehendi, quando corporis per aquam descensuri, v. c. globi plumbei, diameter tubi lumine paulo minor est, integramque adeo tubi aqua repleti, cavitatem fere replet. Quoniam globus enim descendere, nequit nisi suo simile aquæ volumen loco suo expellat, eidem adeo motum, a fundo vasis recedentem, imprimat, totoque adeo descensus illius tempore ejusmodi aquæ volumen, quale globi cadentis magnitudini respondet,

nifum et impetum vi naturali corporum centripetæ contrarium ab eodem accipiat; non potest non rubus crure bilancis fufpenfus totus etiam, quæ ad globi ille defcenfus durat, in *tantum* æquilibrium fuum *amittere*, donec globus ad fundum vafis pervenerit, ficque adeo aquæ aliquod volumen furfum porro pelere definat. Et experimentum ergo ipfum ex *Leibnitii* fententia fpectatum, vitiofum et erroneum, et ad explicandas mutationes barometricas præpoftere admodum eft applicatum. Taceo tandem in toto fuo ratiocinio *circulum vitiofum Leibnitium* commiffiffe. *Caufam* enim redditurus eft, quare ær, oriente vel imminente pluvia, levior evadat, mercuriumque adeo, in vafculo barometri ftagnantem, minus premat: et leviozem tamen jam factum eundem effe *supponit*: fiquidem quamdiu æris gravitas et vis elaftica, qua fuftineri exhalationes in eodem hærentes haftenus poterant, eadem adhuc eft, et manet, nunquam illæ vel in guttulas redigi, vel defcendere per eundem, incipient. Sed pœnitet fere, in re adeo evidenti plura addere. De re ipfa tamen pauca adhuc adjicere liceat.

Magna plerifque imprimis difficultas effe videtur, quæ caufa fit, cur ære turbido, et exhalationibus variis *graviari* facto, mercurius in barometris fubfidat; ferenò vero, adeoque et *leviori* reddito, idem, contra, in iifdem afcendat? quum omnia potius contraria ratione evenire debere videri poffent. Verum quando hoc modo, uti a plerifque quidem fieri videmus, quæftio ifta formatur; annon tacite aliquid affumitur, et fupponitur, quod neque evictum adhuc eft, neque evinci facile poterit: graviozem fcilicet ærem effe factum, quando turbidus et exhalationibus variis repletus

repletus est; leviolem contra quando serenul iterum evasit. Imo, annon tacite simul supponitur, vapores et exhalationes istas tunc demum aërem nostrum *subire*, vimque adeo ejus elasticam imminuere, quando in conspectum nostrum prodeunt? *abesse* vero, contra, aëremque adeo iisdem liberum, et repurgatum esse, quamprimum visui nostro iterum se subducunt? Utrumque igitur hoc suppositum si negaverimus; maxima difficultatum hac in re adhuc motarum pars statim evanescit. Negari vero utrumque gravissimas ob causas posse, imo negandum omnino esse, videtur. Quis rerum enim peritus v. c. largietur, pulvisculos solares in aëre nos ambiente prius non adesse quam in camera obscura in conspectum nostrum prodeant; adesse vero, iterum desuisse, ex quo lumini aditus iterum undiquaque patefactus fuerit? Aut, ut tot alia, cum salibus acidis et alcalinis instituta experimenta hic prætermittamus, satis alias cognita, exemplo ad rem præsentem magis faciente utamur: quis est qui ignoret, in campana vitrea, orbi madido antliæ pneumaticæ imposita, quamprimum agitari antlia incipit, nubeculas quasdam statim oriri, quæ, eodem illo aëre iterum admisso in eadem illa campana mox iterum dispareant et evanescant? Jam nemo vero adeo harum rerum temere imperitus est, qui existimet, exhalationes istas aqueas ex quibus nubeculæ istæ oriuntur, tunc demum campanam vitream subiisse quando in conspectum nostrum, imminuta vi aëris elastica, veniunt; aut nullo modo in eadem amplius superesse, postquam visui nostro iterum se coeperunt subducere, aërisque, a quo antea sustinebantur, postquam magis gravis et elasticus iterum factus est, poris denuo condi. Adesse ergo exhalationes

lationes istas novimus antequam propius ad se invicem accedant, et visibiles nobis evadant; neque anninilari easdem, aut in aëre amplius non superesse scimus, quando magis dissipatæ visum nostrum, ob subtilitatem suam maximam, fugiunt. Accedere autem propius ad se invicem incipiunt, quando vis aëris elastica in tantum imminuta est, ut sustineri ab eodem, uti antea, commode nequeant; et recedunt iterum, visumque nostrum afficere desinunt, quando prior sua aeri gravitas, et vis elastica est reddita. *Utrumque* ergo hoc *simul* contingit, ut aëris nempe imminuatur vis elastica, eodemque tempore exhalationes, per eundem hærentes, ab eodem paulisper dimitti, visuique nostro se sistere incipiant: iterumque, ut aeri sua redeat vis elastica, simulque exhalationes et vapores, in eodem hærentes, dissipentur et evanescant; *alterum* tamen alterius *causa* dici propterea nequit: neque aër ergo ob easdem exhalationes alio tempore magis, alio minus gravis, etiam dici poterit.

Quodsi idem ergo in aëre, terram nostram ambiente, contingere supponamus; maxima difficultatum pars jam corrui. Ponamus enim vim ejus elasticam, quacunque etiam ratione id eveniat, de quo mox plura, imminui; exhalationes in eodem hærentes subsidere, et visibiles fieri, necesse est: eadem vero quomodo-cunque restituta, vapores nubesque, in eodem præfentes, iterum dissipari, et evanescere. Eodem vero tempore, quo vapores isti subsidentes in conspectum nostrum veniunt, mercurii quoque in barometris, imo sæpe jam aliquamdiu ante ob eandem causam subsidere incipit; neque vapores tamen isti ad hujus descensum quicquam conferunt simili modo, quando vapores nubesque disparere per aërem, nos ambientem, incipiunt,

incipiunt, vel aliquamdiu etiam ante jam, mercurius in barometris incipit ascendere; aëris tamen ista serenitas æque minus causa ascensus mercurii in barometris est, ac mercurii ascensus causa serenitatis istius dici potest. *Causæ* ergo iterum dici meretur *fallacia* quando duorum istorum phænomenorum, quæ eodem circiter tempore contingunt, alterum referri ad alterum solet, alterum adeo pro alterius causa hætenus a plerisque haberi.

Quo ad oculum vero hoc omne eo magis pateat, sumatur (v. c.) cylinder vitreus, luminis trium aut quatuor circiter digitorum, utrinque apertus, et adeo longus, ut barometrum aiquod portabile immitti eidem possit. Cylinder ille imponatur aliquantisper, ante experimentum, orbi, aqua corioque madido obtesto, antliæ, quo vapores nonnulli aquei subitæ aërem, eodem contentum, interea possint. Immittatur postea barometrum, exacteque cylinder superne claudatur, quo aër possit exhauriri. Quodsi omnia rite curata fuerint, aërque inclusus antlia incipiatur educi; et *nebula* quædam statim in cylindro isto *oriri*, et *mercurius* barometri simul *subsideri*, incipiet: utrumque equidém, quod satis apparet, ab una eademque causa, neutrum tamen ab alterutro. Quodsi idem vero, qui subductus modo erat, aër statim intra cylindrum vitreum iterum admittatur; aëri incluso sua mox redibit *serenitas*, mercuriusque barometri simul, imo paulo adhuc citius, *ascendet*: neque alterum tamen ab altero iterum pèndere, satis patet. Imo neque illo casu aërem *graviozem*, neque hoc *leviorem* factum esse manifestum satis simul est. Ita ars quodammodo imitatur naturam; ob *mistas* tamén causarum naturalium complicationes nunquam exacte satis potest.

Et si

Etsi ita primarium, vero hac in re offendiculum sublatum esse videtur; res tamen tota hoc ipso nondum confecta est. Disquirendum enim adhuc restat, quibusnam causis ita vel imminui vel augeri vis aëris elastica possit, ut illæ præ mutationes inde proveniant? Non adeo difficile tamen videtur, quid hic respondendum sit. Quibus enim constat, quam facillime *calore* quocunque accedente aër expandatur, et rareseat, quantaque *scalarium* perpendiculariter imprimis incidentium, *radiorum* vis sit; illis vel sola hæc causa forsitan jam videbitur sufficere ad aëris passim tollendum æquilibrium, si vel maxime nullæ aliæ, quæ variæ tamen adhuc esse possunt, accederent. Mittamus autem jam terræ, aërisque adeo nostri *diurnam*, circa axem suum *revolutionem*; mittamus etiam terræ aërisque simul nostri *motum* circa solem *annuum*; nihilque de tot in terræ nostræ superficie existentibus *montibus ignivornis*, nihil de tot in aëre oriundis *fulguribus* et *fulminibus*, nihil denique de tot furentissimis terræ marisque superficiem passim, ipsumque adeo aërem, concutientibus *terræ motibus*, *ignibusque* adeo e terra erumpentibus *subterraneis*, addamus, etsi singulorum mira in augenda, vel imminuenda, passim aëris vi elastica potest esse efficacia: atque unum quod præ cæteris memoratu dignum esse videtur, in præsentī solum consideremus.

Vim aëris terræ nostræ superficiem proxime attingentis elasticam a pondere aëris incumbentis imprimis pendere satis inter omnes constat. Pro majori ergo aut minori incumbentis columnæ aëreæ altitudine aërem inferiorem magis aut minus etiam elasticum esse, ex diversis barometrici mercurii in montibus magis minusque excelsis, locisque terræ depressioribus, altitudine,

altitudine, fatis non minus est notum. Neque minus tandem inter omnes constat, primariam fluxus refluxusque marini causam lunam imprimis nostram esse. Quocunque vero modo etiam mirabile hoc phænomenum a lunari corpore in terra nostra efficiatur, de quo in præsentī non attinet speciatim agere; id certe dubitatione omni videtur carere, lunam in terræ nostræ *maria*, quocunque etiam modo agat, non posse agere, nisi et in *aërem*, inter ipsam terramque nostram *interjacentem*, eodem simul tempore et modo agat. Quodsi corporum ergo fluidorum mobilitas rationem densitatis, densitas vero eorundem rationem gravitatis ipsorum specificæ, habet; aër, terræ proximus, qui aqua dulci 860, circiter levior est, marina aqua 900 circiter vicibus erit mobilior: adeoque et eadem illa causa, quæ maribus nostris adeo constantem et ordinatissimum motum imprimis, iisdem agendi viribus, aëris nostri altitudinem nunc augere, nunc imminuere, multo facilius poterit. *Fluxu* ergo quasi quodam in aëris determinata regione oriundo, non possunt non columnæ aëreæ eodem in loco *altiores* fieri, eoque ipso et vis elastica, inferiores, cæteris paribus, augeri; *refluxum* autem quodam exorto, *altitudinem* columnarum aërearum eodem in loco *imminui*, sicque adeo, cæteris iterum paribus, inferioris aëris vim elasticam decrescere, necesse est. Atque hæc altitudinum differentia eo major forsitan est, quo magis aëris, in extremis atmosphæræ nostræ limitibus rarissimi, gravitas specifica, a gravitate specifica aquarum nostrarum marinarum, ipsiusque aëris inferioris, vincitur et superatur. Quo minus vero vices suas alternas aëris ille fluxus, refluxusque æque ordinate et constanter, ac marium ille æstus
reciprocus,

reciprocus, observet; præter maximam ejusdem fluiditatem, ob quam a levissimis agitari causis potest, antea enumeratæ causæ proculdubio efficiunt, quibus miras quippe, omni fere tempore, sive in hac, sive in alia, globi nostri terraquei parte, aëris agitationes et perturbationes oriri, satis constat. Ab his ergo causis omnibus, simul sumtis, columnarum aërearum locis temporibusque diversis mutatæ altitudines, atque ab his porro in aëre inferiori pendentes mutationes, cum ipsis phænomenis barometricis erunt rep. tendæ.

Restat unicum, paucis tangendum. Solicitos multos esse videmus, de *præsagiendis* ex mercurii in barometris sive ascensu sive descensu, *tempestatibus*, deque *regulis* eum in finem certis condendis laborare: quum unicus hic esse videatur, quem rerum naturalium non satis alias periti expectare a mirabili hac machina usum possint. Atque utinam vel de eo solum certi aliquid jam constaret, siquidem magna jam hoc ipso rebus humanis afferri utilitas posset. Non videntur vero, quæ ita conjuncta esse volumus, inter se necessario esse connexa. Baroscopia enim nostra, præter incrementum vel decrementum, vis elasticæ aëreæ nihil nobis proprie, et per se, indicant, aut indicare possunt; tempestates vero omnes a varii generis exhalationibus, eodem tempore vel simul in aëre existentibus, vel non existentibus, vel non eadem saltem copia semper præsentibus, unice pendent. Fieri ergo potest, ut, quo vis aëris elastica forte imminuitur, mercuriusque adeo in barometro descendit, sufficiens exhalationum crassiorum, in aëre copia simul adsit, hique turbidus inde evadat, vaporesque adeo porro subfidere, imo in majores minoresve guttas pluvias coalescere, incipiat, aliaque ejusmodi phænomena coniequantur.

consequantur. Fieri vero æque facile potest, ut, aeris elasticitate licet imminuta, ob sufficientium tamen exhalationum in eodem defectum, nulla fere sensibilis tempestatis mutatio subsequatur. Idem contraria se ratione habere potest ob nimiam exhalationum in aëre copiam; licet vel maxime mercurius ascendens, auctam vim aeris elasticam esse, evidentissime ostendat. Quoniam ergo *casu* quasi quodam hæc solum *coincidunt*; nulla certa ex mercurii sive ascensu sive descensu, futuræ tempestatis capi præagia posse videntur. *Negative* tamen inde satis tuto videtur posse concludi. Constans enim fere observationum docet consensus, si descensum mercurii turbida subsecuta tempestas fuerit, serenam prius non redire quam ascendere mercurius iterum cœperit: aut si ascensus mercurii cum serena tempestate copulatus fuerit, nubilam pluviamque, aut huic similem aliam, non subsequi, nisi descendere prius mercurius cœperit. Atque hoc æque magnum sæpe in vita communi usum habet, ac si *positive* semper possemus prædicere, qualis ascensum descensumque mercurii tempestas præcise sit insecutura. Lapsum tamen mercurii *frequentius* turbidam quam serenam; ascensum vero ejusdem serenam magis, quam turbidam tempestatem insequi, experientiâ multiplici non minus confirmatur: magnoque adeo usui sæpe esse potest, *utius* in casibus ejusmodi obvenientibus eligere. Vento tamen ex plaga aliqua, inter boream zephyrumque intermedia spirante, pluviam turbidamque tempestatem frequentius vel oriri, vel ortam continuari, quam serenam, mercurio in barometris licet ascendente, etiam in his regionibus, cum aliis notatu dignis, jam sæpe mihi observatum est: de quo alias forsân plura.

V. *A Letter from Captain John Waddell to Mr. Naphthali Franks Merchant, concerning the Effects of Lightning in destroying the Polarity of a Mariners Compass; to which are subjoined some Remarks thereon, by Gowin Knight, M. B. F. R. S.*

S I R,

Horslydown, Feb. 22, 1748-9.

*Read April 13.
1749.*

Agreeable to my Promise I have here inclos'd you the Heads of our Misfortune, and have also sent you one of the Compasses, and am, with great Esteem,

S I R,

Your most obedient humble Servant,

John Waddell.

IN the 9th of *January* 1748-9. the new Ship *Dover*, bound from *New York* to *London*, being then in Lat. 47° 30' North, and Longitude 22° 15' West, from *London*, met with a very hard Storm of Wind, attended with Thunder and Lightning, as usual, most Part of the Evening, and sundry very large Comazants (as we call them) over-head, some of which settled on the Spintles at the Top-mast Heads, which burnt like very large Torches; and at 9 *p. m.* a single loud Clap of Thunder with Lightning struck the Ship in a violent manner, which

which disabled myself, and great Part of the Ship's Company, in the Eyes and Limbs; it struck the Mainmast about $\frac{2}{3}$ up almost half-through, and stove the upper Deck one Carling, and Quick-work; Part of which Lightning got in between Decks, started off the Bulk-head, drove down all the Cabbins on one Side of the Steerage, stove the lower Deck, and one of the lower Deck main Lodging-Knees.

Another Part of it went through the Starboard Side, without any Hurt to the Ceiling (or inside Plank); and started off from the Timbers four outside Plank being the Whale upwards; one of which Planks, being the second from the Whale, was broke quite asunder, and let in, in about 10 or 15 Minutes time 9 Feet Water in the Ship.

It also drew the Virtue of the Loadstone from all the Compasses, being four in Number, all in good Order before, one in a brass and three in wooden Boxes. The hanging Compass in the Cabbin was not quite so much disabled as the rest; they were at first very near revers'd, the North to the South; and after a little while rambl'd about so as to be of no Service. The Storm lasted five Days, we lost our Mainmast and Mizenmast, and almost all our Sails; arriv'd at *Cowes* the 21st of *January* in a very shatter'd Condition.

An Account of the Mariners Compass, that was struck with Lightning, and shewn at the last Meeting of the Royal Society; with some further Particulars relating to that Accident; communicated by Gowin Knight, M. B. F. R. S.

WHEN I came to examine the Compass struck with Lightning, I observed that the outward Case was joined together with Pieces of iron Wire, 16 of which were found in the Sides of the Box, and 10 in the Bottom. I applied a small Needle to each of these Wires, and immediately perceived that the Lightning had made them strongly magnetical; particularly those that joined the Sides. All the Heads of the Wires on one Side of the Box attracted the North Point of the Needle, and repelled the South; whilst all the Heads on the other Side attracted the South and repell'd the North. The Wires at the Bottom attracted the South and repelled the North; but it is not certain, whether this Polarity was any-ways owing to the Lightning; since it might be acquired by their continuing long in an erect Posture.

In examining the Card, I found the Needle was vigorous enough in performing its Vibrations, but that its Polarity was inverted; the North Point turning constantly to the South. I then tried to take out the Card, to examine the State and Structure of the Needle: But the Junctures were every-where well-secured with Putty, and that grown so hard, that I was obliged to use some Violence, and at last broke the Glass. The Needle (if I may so call it)

consisted of two Pieces of Steel Wire, each of which was bent in the middle, so as to make an obtuse Angle; and the Ends of these Wires applied together, forming an acute one, the whole appear'd in the Shape of a Lozenge; in the Centre of which was placed the brass Cap whereon the Card turned. And so far was it from being made with any tolerable Degree of Exactness, that there was not the least Care taken either to bend the Wires in the middle, or to fix the Cap exactly in the Centre of the Lozenge: For, upon trying it with a Pair of Compasses, I found its greatest Eccentricity to be full $\frac{2}{10}$ of an Inch. The Pin, upon which it turned was made of a Slip of Plate-Brass sharpened to a Point.

Besides the Particulars already communicated to the Society, the Captain informed me, that he was obliged to sail above 300 Leagues, after this Accident happen'd, without a Compass, till he arrived at *Cowes* in the *Isle of Wight*; where being provided with one, he placed it in the Binacle, but was much surprized to find that it varied from the Direction it stood at when out of the Binacle nearly 2 Points. He removed the Binacle to different Parts of the Deck, but found that it always made the Needle to vary after the same manner when placed in it. He repeated the same Experiment lately in the River, with the like Success; only that he observed, that the Variation of the Needle, when placed in the Binacle, was rather less than at first. It was natural to inquire if there was any Iron about the Binacle; but I was surprized when the Captain informed me, he had given strict Charge to the Maker, not to put so much as a single Nail in it; and that he firmly believed

believed that there was not the least Bit of Iron about it.

Being willing to be satisfied of the Truth of a Circumstance so very extraordinary, the Captain was desired to send the Binacle to a House in the City; where, in Company with the Captain, Mr. *Ellicot*, and another Gentleman, I tried it with a large Compass touched by my Bars; but finding no sensible Variation, we at that time desisted, thinking the Fact quite improbable: But having discovered the Effect which the Lightning had produced upon the Wires which fastened the Sides of the Compass-Box, I was induced to examine the Binacle a second time; which I did with a small Compass, and with great Care, in every Part; and at last, about the middle of the Binacle, I found it to vary very sensibly, but could not discover any Nails or Iron any-where thereabouts; till, turning it up to examine the Bottom, I there found 3 or 4 large Nails, or rather Spikes, driven thro' it to fasten the upright Partitions in the middle of the Binacle.

It would not be difficult to explain why any Needles, under the like Circumstances with those above-related, should be render'd useless by Lightning, tho' the Needles themselves had remained unhurt. So many iron Wires made strongly magnetical would doubtless have effected it; and 3 or 4 large Nails in the Binacle, if made magnetical, would alone have been sufficient to have done it. But I have already taken notice that the Polarity of the Needle was inverted by this Accident; and I would further observe, that all Needles constructed after this manner are liable to be render'd useless, not only by the

Lightning's destroying their Virtue, but also by its placing it in a particular Direction; *e. g.* if the Lightning struck the Needle in the Direction of either of the two parallel Sides of the Lozenge, it must strike the other two Sides very obliquely; whereby the first two Sides may have their Polarity destroyed, and a very strong one given them in the contrary Direction; whilst that of the other Sides, if it be inverted, will be very weak; but it is probable that the Virtue would be placed obliquely in the Direction of the Stroke; in either Case, these two Sides can contribute but very little (if any thing) in directing the Card; and if the two first Sides only are capable of acting upon it, it will point in the Direction of those Sides, which will produce a Variation of about 4 Points.

It may further be observed that a Needle would not continue long in this State, but would every Day grow more and more regular; because if the Virtue be placed obliquely, it generally turns itself in the Direction of any Piece of Steel that is long and slender; and that may be the Reason why this Card is now become regular, except that it is inverted.

The Wires that join the Box seem weaker than when I first examin'd them; which makes it very probable that they might be vastly stronger when first struck with the Lightning: And the same may be likewise true, in regard to the Nails in the Binacle; which may account for the Experiments not answering exactly the same as at first.

From what has been said it appears, that this Form of Needles is very improper, and ought to be changed
for

for that of one strait Piece of Steel; and then if a Needle should be inverted it might still be used. It also shews the Absurdity of permitting Iron of any kind about the Compass-Box, or the Binacle. Whoever considers the whole Description here given of this Compass, I am persuaded, he will esteem it a most despicable Instrument: How then must any one be shocked to hear, that almost all the Compasses, made use of by our trading Vessels, are of the same sort! the Boxes all joined with iron Wire, and the same Degree of Accuracy observed throughout the Whole!

This I am credibly informed, is the Case; and that for no other Reason, but that one of this sort may be purchased for 5*s.* and it will cost about 2*s.* 6*d.* more to buy a tolerable good one. So that the Lives and Fortunes of thousands are every Day hazarded for such a trifling Consideration.

VI. *A Letter from Sir Hans Sloane Baronet, late Pr. R. S. to Martin Folkes Esquire Pr. R. S. containing Accoun^{ts} of the pretended Serpent-stone called Pietra de Cobra de Cabelos, and of the Pietra de Mom-bazza or the Rhinoceros Bezoar, together with the Figure of a Rhinoceros with a double Horn.*

S I R,

Chelsea, April 19, 1749.

Read April 20.
1749.

I HERE send you to be communicated to the *Society*, if you think proper; an Account of two pretended Stones, said to be found in the Head of the most venomous Snake of the *East Indies* called *Cobra de Cabelo*, together with an Account of what I have heard, and what I believe they really are. The first I have heard and do believe to be a Stone found in the Stomach or Intestines of the Rhinoceros; not, that I know, taken notice of by any Natural Historian, excepting *Redi*. The Place where it is said to be found is on the South-East Coast of *Africa*, according to the Information *Redi* had of it, and from which Place I had the two Horns figured in these *Transactions*, N^o. 470, by Dr. *Parsons*, which were tied together across, the better I believe to preserve the short Skin that connected them on the Nose of that Animal, so that the strait and crooked Horn might appear distinct, as they do in a very intire small brass Medal of *Domitian* in my Collection.

Whether

Whether the Rhinoceros, who bore these two Horns, be a distinct Species of that Animal from that of *Asia*, future Travellers must determine

These Horns were given me by my worthy and ingenious Friend and Acquaintance *Charles Lockyer* Esq; who was (as I have been told) sent in a Ship of Strength with a Power given him by the *East-Indian* and *African* Companies, to go on their Affairs to that unfrequented Coast which common Travellers have been afraid to go to because of the Barbarity and Cruelty commonly said to belong to its Inhabitants, and with which the *Egyptians*, and from them the *Greeks* and *Romans*, had a greater Intercourse and Knowledge than with the Southern Parts of *Asia*, where that Animal is generally found with only one Horn. I am,

S I R,

Your humble Servant,

Hans Sloane.

Pietra de Serpenti di Mombazza Redi Esperienze, Nat. p. 59, TAB. II. Lapis Serpentis de Mombaza, Edit. Latin. p. 82.

DR. *Waldo*, an old Acquaintance of mine, went into the *East Indies*, on purpose to search after and collect the natural Productions and Curiosities of those Parts, especially such as related to the Cure of Diseases, which he sent from time to time to his Sister he left in *London*, with Directions to shew them to the Earl of *Pembroke*, Sir *Godfrey Kneller*, and

and myself, to sell. The two former not caring to buy several of them, they fell into my Hands. Among the rest which I purchas'd were some of these Stones, which were by him call'd Rhinoceros-Bezoars, which I supposed were taken out of the Stomach or Guts of that large Animal.

These Productions or Bezoars, as they are commonly call'd, consist of several Coats made up of several Parts attracted by their Centers, such as the Stones of Fruits, and other indigestible Substances swallowed with its Food, after the manner of those found in the Stomach and Intestines of Mankind, and other Animals. The uppermost Coat or Layer of this Bezoar is made up of several brown striated small Knobs or Tubercles something like low Warts, distant from one another, and making its outermost Surface very unequal, as well appears by the Figure of it herunto annexed, TAB. II. *Fig. 1*, and 2. different from the other Bezoars whose Surface is generally smooth. Those I have of this Bezoar are of different Sizes and Diameters, the largest about the Bigness of an Orange, heavy, and as hard as Stone, and capable of being polished;

Redi relates great Virtues belonging to them, as told by the Bringers of them from the *East Indies*; such as, being tied to the Hip or Leg of a Woman in Travail, it helps her Delivery, and without Pain, even if the Child be dead; but with this Caution, that, immediately after the Birth, it should be removed; for if it remains tied there, it brings away the Womb, &c. and the Woman dies.

This I believe to be attributed to them from their Center's being sometimes loose, and rattling within,
like

like an *Ætites* or Eagle-stone, as some of those I have do: Also that it is good for intermitting Fevers given in their Drink at the going off of the Fit; and that it is good for the Colic, and Hypochondriac Melancholy, as may be seen in that Author, who I think is the only one, that speaks of it.

It has been the most rare of any of these Snake-stones, as they are call'd in the *Indies*, and so not-taken notice of.

I was inform'd there was one in *Paris* offer'd, to that great Inquirer after natural Productions the late Duke of *Bourbon*, at the Price of 100 Pistoles; to whom I signified by some of his Acquaintance, that I had more than one of them, and would make him a Present of one, which I afterward did, lest he should be impos'd upon by giving such a Price, as some curious Persons have often been in other Things of the like Nature.

Pietre del Serpente. Cobra de Cabelo * Redi *Esperienze*, Nat. p. 3. Tab. 1. *Lapides Serpentis* Cobras de Cabelo dicti, Edit. Latin. Pedra de Cobra, Kempfer. *Amœnitat. Exot.* p. 396. *Pierres de Serpent*. Biron *Curiosit. de la Natura*, &c. p. 72.

DR. *John Bateman*, my worthy Predecessor, formerly *President* of the *College of Physicians* of *London*, told me, with great Admiration, that he had

* Which signifies in *Portuguese*, the hooded Serpent, because it has a Membrane about its Head which it can expand like an Hood: By others it is called the Spectacle-Snake; for on the back Part of its Neck is the Representation of a Pair of Spectacles. See a Figure of one in *Kempfer's Amœnit. Exot.* p. 567.

had seen the great Effects (upon the Bite of a Viper) of the Snake-stone or Serpent-stone, as it is call'd, before King *Charles II.* who was a great Lover of such Natural Experiments; and that he knew the Person possessed of the very Stone he had seen tried, who he believed would part with it for Money.

Upon my Desire and Request to see him, he came to me, and brought with him the Stone, which was round and flat, as the common ones brought by Merchants and others from the *East Indies*, about the Size of a mill'd Shilling, but thicker, for which he asked five Guineas, tho' it was broken. There are several of this Sort, figur'd in TAB. II. *Fig. 8. a, b, c, d.*

Dr. *Alex. Stuart*, who had been my Acquaintance for several Years, returning from the *East Indies*, brought from thence, among many other Curiosities, some of these Snake or Serpent-stones, together with this Account of them, which he had from a Father Missionary in the *East Indies*, 'that they were 'not taken out of a Serpent's Head, but made of 'the Bones of the small Buffalo in the *Indies*' (by which their Coaches are drawn instead of Horses); the Bones being half-calcin'd or chard by the Dung of the same Buffalo. He gave me several Pieces, with some of the Snake or Serpent-stones made out of them, and which I have in my Collection of several Shapes and Colours,

I think the first who gives any Account of them is *Francesco Redi* at *Florence*, who had them from the Duke of *Tuscany's* Collections, and who, in his *Esperienze Nat.* tells great Virtues of them, related by three *Franciscan* Friars, who came from the *East Indies* in 1662. which were, that, being applied



Fig 8. p 122

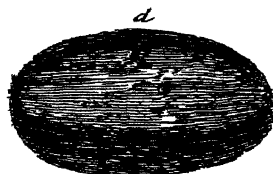


Fig. 7. p. 125.

Fig. 5. p 124.

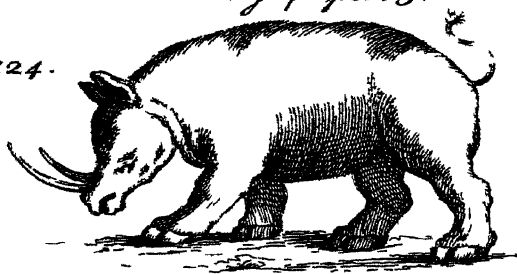
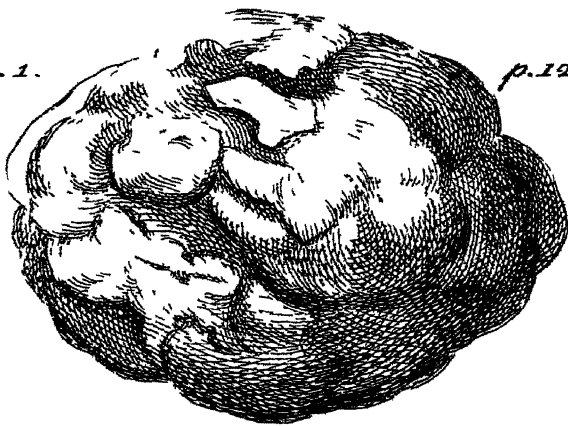


Fig. 1.

p. 123.



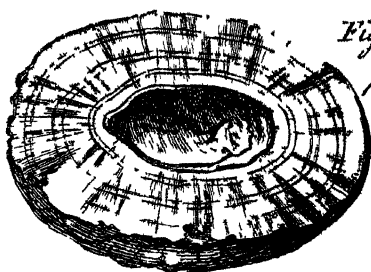


Fig. 4.

p. 124.

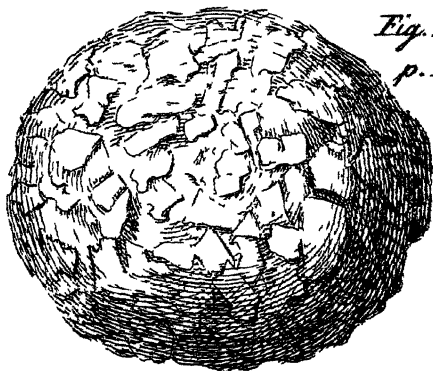


Fig. 2.

p. 123.

Fig. 6. p 125

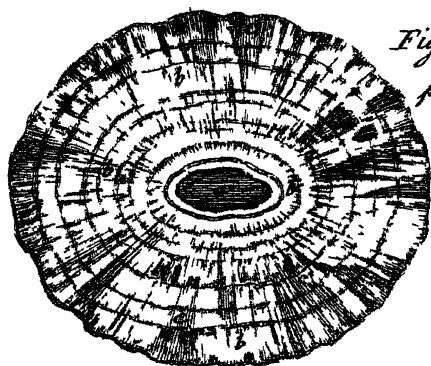


Fig. 3.

p. 123.

plied to the Bites of the Viper, Asp, or any other venomous Animals it sticks very fast till it has imbibed or attracted all the Poison (as a Loadstone does Iron), as many People in the *Indies* believe, and then it falls off of itself; and being put into new Milk, it parts with the Poison, and gives the Milk a bluish Colour; of which *Redi* tells the Success of those he figured.

Kempfer, in his *Amoenitat. Exot.* p. 396. speaking of this, says, it helps those bit by Vipers, outwardly applied; and that it is not found in the Serpent's Head, as believed, but by a secret Art made by the *Brahmens*; and that, for the right and happy Application of it, there must be two ready; that when one has fallen off fill'd with the Poison, the other may supply its Place. They are commonly, as he says, kept in a Box with Cotton, to be ready when Occasion offers.

Biron says, that if the Wound of the Serpent has not bled, it must be a little prick'd, so as the Blood comes out, and then to be applied as usual. It comes from the Kingdom of *Camboja*.

TAB. II.

Fig. 1. A *Pietra de Mombazzia* $2\frac{3}{4}$ Inches in Diameter, weighing $10\frac{1}{2}$ oz. 3 dr. 13 gr. with large Prominences or Embossments on the Outside.

Fig. 2. another $2\frac{1}{4}$ in Diameter, with smaller Embossments on the Outside.

Fig. 3. the same saw'd in two, and the Section polish'd, wherein appears a common Pebble *a*, of an

an Ash-colour, as the Core or Center on which this Stone was form'd.

bbbb, are several almost concentric Lines, nearly answering to the Shape of the Pebble in the Center, and resemble the different Coats of an Onion; shewing the progressive Accretion of the several *Laminae* or *Strata*, of which this Stone is composed.

cccc, pyramidal Spaces of a darker Colour, and more compact Texture than the intermediate lighter-colour'd Spaces, whose Bases arise at the outer Circumference and form the Embossments there, and whose Points all tend towards the Center of the Stone; both the Outside and Inside of these Stones are of a light Oker-colour diluted with a little white; the Pyramids being about 2 Shades darker than the rest of the In- or Outside.

Fig. 4. another of the same sort sawn in two, in the Center of which is lodged a Fruit or large Seed, about the Size and of the Shape of an Acorn, having a thick Husk on the Outside.

Fig. 5. a Coin of *Domitian* in small Brass, having on the Foreside, the Figure of a Rhinoceros with 2 Horns growing out of his Nose, the one above the other; which in the *Numismata Pembrokiana*, Part I. TAB. XVI. n. 68. the Engraver has made like a Tusk or *Dens exertus* of a Boar, and in Part 3. TAB. 39. he has made the 2 Horns on his Nose like 2 Tusks, and has likewise given him 2 Horns close to his Ears; so that he has made him a Creature with 4 Horns; and therefore it was thought proper to give an accurate Copy of the

the Medal, in order to clear up that famous Passage of *Martial*, *Lib. de Spectac.* N°. XXII.

*Namque gravem gemino cornu sic extulit ursum,
factat ut impositas taurus in astra pilas.*

Which has for many Ages puzzled the Critics, all thinking that the Rhinoceros was a real Unicorn or Animal, which never had any more than one Horn. See these *Transf.* N°. 470, p. 537. and beside the double Horns, or *geminum Cornu*, in Sir *Hans Sloane's Museum*, I am told Dr. *Mead* has got another *geminum Cornu* likewise from *Africa*.

Fig. 6. is the reverse of the same Medal, with this Inscription IMP DOMIT AVG GERM and in the middle sc

Fig. 7. is the Figure of the Rhinoceros magnified, that the Position of the 2 Horns might appear distinct and plain.

Fig. 8. a, b, c, d, represent the *Pietre de Serpente Cobra de Cabelo*, of an Ash-colour and black. In that mark'd *b*, the dark Shade in the middle shews an Hollow, which was Part of the Cavity of the Inside of the Bone. *e* and *f* are rough Pieces of Bones, half-calcin'd, porous, and not polish'd. The Figure and Description of the Buffalo, whose Bones they use for this Purpose, are given in Mr. *Edwards's* History of Birds, to which he has sub-joined the Figures and Descriptions of some few rare Quadrupeds. *Plate 200.*

VII. *Some Account of the Rana Piscatrix; by James Parsons M.D. F.R. S.*

Read April 17. 1749. **I**N some Parts of *Italy* this Fish is called *Rospo*; in others *Bora*; and by the *Lombards Zatto*.

Lophius ore cirroso, Petrus Artedus.

ὁ ἀλίας βάτον, βαλραχὸς ἀλίας.

Aristot.

Rana Piscatrix, by the following Authors; viz. *Bellonius, Rondelletius, Salvianus, Gesnerus, Charleton, Willoughby, Ray.*

Piscatrix vel marina. Schonveld.

———— *vulgaris. Aldrovand.*

ALTHO' this Fish is already described by most of the Natural Historians, yet several of its Properties appear to have been overlook'd; and as I am persuaded many of this Learned Society may not have seen it, I laid hold of this Opportunity to lay it before them, with some little Account, and Drawings, I believe nearer the Truth than any exhibited already; referring the Curious to the general History of this Animal, as collected by *Gesner*; and to Sir *George Ent's* Account and Dissection of him, as deliver'd by Dr. *Charleton*, in his *Exercitationes de Differentiis et Nominibus Animalium*; whose Figure of him is copied by *Willoughby* with most of the Dissertation, and which, if I mistake not, was taken from *Salvianus* by Dr. *Charleton*, for the better Illustration of Sir *George's* Dissertation.

This Animal is four Feet three Inches long, and about nineteen Inches from Side to Side in the widest

Part

Part. His Mouth is very wide, and his Teeth are set in Clusters in both the upper and under Jaws, and not in regular Rows, as was the vulgar Opinion: They are long and small like Spikes, moveable, and directed inward, in order to secure his Prey from escaping, after he has once laid hold on him. His lower Jaw is longer by far than his upper; having a large Capacity in the Skin of the former, to yield according to the Bulk of the Creature he seizes; for with this Jaw, and the external Clusters of the Teeth of the upper Jaw, he holds it fast, whilst with another inner cartilaginous Jaw (whose Teeth correspond with an inner Cluster of Teeth in the upper) he chews and tears his Prey, swallowing it by degrees as he minces it; neither the under Jaw, nor external Row of the upper, having any Share in the Mastication at all.

Altho' he is said to be of the cartilaginous kind, his Head is as bony as that of any Fish; having rough spiny Ridges, serving as Eye-brows. Between these arise three black limber Twigs; the anterior is longest, the second shorter, and the next shortest; each having at its Extremity a white flat Piece, with which, it is said, he allures other Fish to approach near enough to seize on them. There are two others less considerable on his Back, between those Fins or Webs, which, in him, must be call'd *humeral* Webs.

These Webs are cartilaginous and fleshy, and are supported by strong Bones, analogous to the humeral Bones of some other Animals. Under each of these is a *Sacculus* or *Marsupium*, which runs up the Side of his Head, 28 Inches deep, and 6 Inches wide: These

These have not been duly taken notice of, except I think by *Bellonius*, who mentions two Holes, without adding any thing else about them. But they are of so singular a Nature, that I think there is some Encouragement to make the following Conjecture.

The branchial Holes are three on each Side, which are situated deep in the Mouth, and open into these *Marsupia*, the Sides of which are the *Brancheostegæ*, having several long slender cartilaginous Bones running longitudinally for their Support, analogous to the *brancheostegal* Bones of other Fishes; so that probably these Sacks may answer two Ends; first, to form the *Membrana brancheostegæ*; and, secondly, to make a convenient Receptacle for the Young, till they are able to shift for themselves. Perhaps the following Conjectures may serve to strengthen this Opinion; for if this End was not to be answer'd, the *Branchiæ* might have been terminated near their Origin in the Mouth, as it is in other Fishes.

Authors have ranked this Fish among the cartilaginous Tribe, who are said to be viviparous; but of this there are Disputes among them as yet undetermin'd. Now if this Fish does not bring forth its Young perfect, there can be no Use assign'd to these Sacks; for Eggs are deposited by the oviparous Tribe in Sand, Weeds, or any other proper *Nidus*; nor could the Creatures by any means place Eggs in them, because they open in a wrong Direction for such a Purpose. But if they are viviparous, then the Young may probably be harbour'd in them, being capable of crawling into them, as we may see by the pectoral Webs on the under Side.

And to strengthen this Conjecture, we may draw another Consideration from the Manner of their Feeding; for these are Creatures of no swift Motion, and crawl on Bottoms of shoal Places, watching and alluring their Prey; now their Young cannot be supposed to have Power or Sagacity enough for this Work, till they are grown large and strong, and have these Twigs in Perfection; therefore they must of Necessity be protected by the Parent, till they are able to provide for themselves; which probably may be when they grow too large to enter into these *Marsupia*.

There are seven small finny Webs like little indented Leaves, on each Side the under Jaw, and others of the same kind all round the Sides to the Tail.

He has a dorsal Fin near the Tail upon the Spine, and a ventral fleshy Fin nearer the Tail than the former.

The five-finger'd Webs under the *Thorax* are rough and fleshy, shewing their Business is to assist in slowly crawling from Place to Place; and there appears the Vestige of the Spine from the Place of the Vent to the Tail on the most posterior Part of the Belly.

These are what I thought worthy your Notice, and hope they will have produced the Effect I designed; which was no more than to entertain you, by illustrating any singular Piece of natural History, that may happen to fall in my Way; especially in such Subjects as do not often occur.

As to the Sex of the Fish, I could be no Judge of it, nor of any internal Part, as the *Viscera* had been

taken out before I saw it, and all Appearances destroy'd that might inform us ; and therefore we must refer the Reader to that curious Dissection of it made by the learned Sir *George Ent*, as it is quoted by *Charleton*, in his *Mantissa Anatomica*.

References to the Figures.

Fig. I. is a back View of the *Rana piscatrix*.

aa, the bony Ridges and Asperities between the Eyes ;
from the central *Sulcus* of which arise

bbb, the three *Virgæ piscatoriae*, or Fishing rods.

cc, the *Cirruli*, or little Webs, all round the Borders
of the Fish.

dd, the large humeral Fins, under which are the
Openings into the *Marsupia* and *Branchiae*.

ee, the two posterior Rods.

f, the posterior and superior spinal Fin.

g, the Tail, which in this Fish is vertical.

Fig. II. A View of the under Surface or Belly of
this Fish.

aa, the Angles of the lower Jaw, seen and felt
through the Integuments.

b, the Skin or Floor of the Mouth capable of stretch-
ing into a Sack, according to the Bulk of the Prey
he holds.

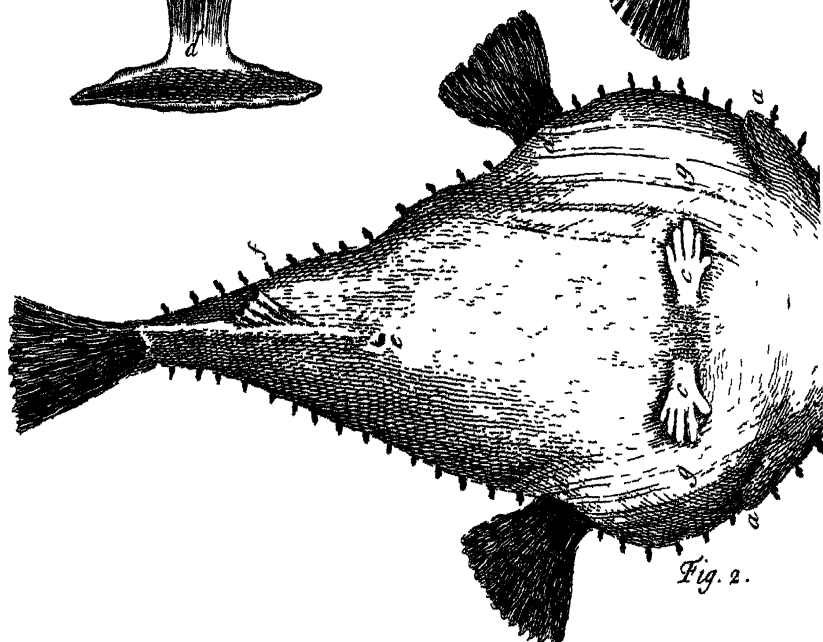
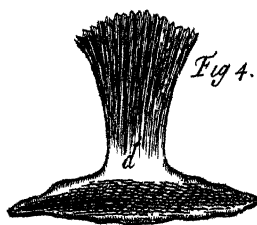
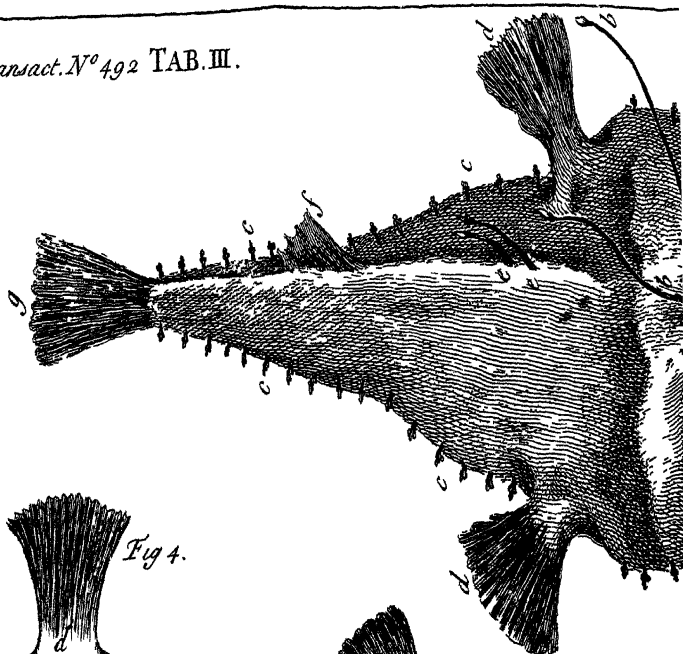
cc, the fleshy five finger'd Webs, by which they crawl
upon the Bottoms of Shoals.

dd, the Openings into the *Marsupia* and *Branchiae*.

e, the Vent or *Anus*.

f, the posterior and inferior spinal Fin.

g, the cartilaginous *branchiostegal* Bones.



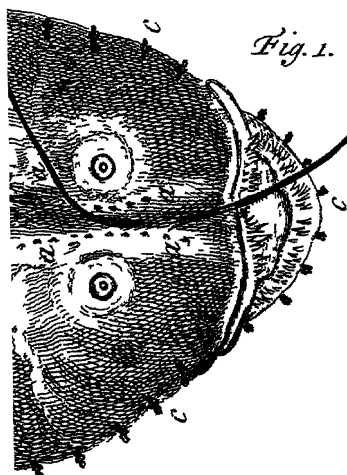


Fig. 3.

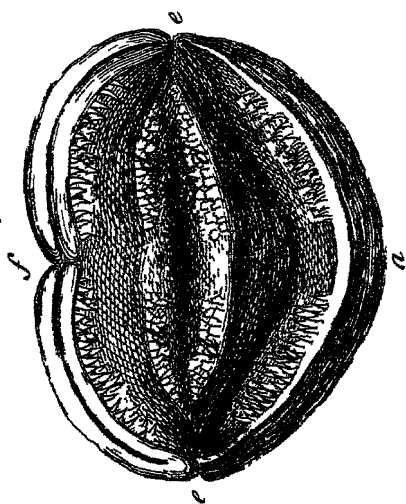


Fig. III. is a View of the Mouth open'd to shew,

a, the Skin of the Floor of the Mouth, as at *b* in *Fig. II.*

b, the Tongue.

cc, the external Teeth in the upper and under Jaws, for holding the Prey.

dd, the corresponding Clusters of Teeth in the inner cartilaginous Jaw, for Mastication, and tearing the Prey.

ee, the *Rictus oris*. *f*, the upper Jaw. *g*, the Entrance into the *gula* and branchial Holes.

Fig. IV. is a full View of the Opening into the *Marsupium*, lying under the Fin *d*.

VIII. Observations on the Height to which Rockets ascend; by Mr. Benjamin Robins F. R. S.

Read May 4. 1749. **T**HE Use of Rockets is, or may be, so considerable in determining the Position of distant Places to each other, and in giving Signals for naval or military Purposes, that I thought it worth while to examine what Height they usually rise to, the better to determine the Extent of the Country, through which they can be seen. I therefore, at the Exhibition of the late Fire-works, desir'd a Friend of mine, who I knew intended to be only a distant Spectator, to observe the Angle of Elevation to which the greatest Part of them rose, and likewise the Angle made by the Rocket or Rockets, which should rise the highest of all.

My Friend was provided with an Instrument, whose *Radius* was 38 Inches; and, to avoid all Uncertainty in its Motion, it was fixed in an invariable Position; and its Field, which took in ten Degrees of Altitude was divided by horizontal Threads. The Station my Friend chose was on the Top of Dr. *Nisbett's* House in *Kingstreet* near *Cheapside*, where he had a fair View of the upper Part of the Building erected in the *Green Park*. There he observed that the single Rockets which rose the most erect, were usually elevated at their greatest Height about $60^{\circ}\frac{1}{4}$. above his Level; and that amongst these there were 3 which rose to $70^{\circ}\frac{1}{2}$; and that in the last great Flight of Rockets, said to be of 6000, the Crest of the Arch, formed by their general Figure, was elevated about $80^{\circ}\frac{1}{4}$. From the Care and Dexterity of my Friend, and the Nature of the Instrument, I doubt not but these Observations are true within a few Minutes.

The Distance of this Station from the Building in the *Green Park* is 4000 Yards, according to the last Great Map of *London*: And hence it appears, that the customary Height, to which the single, or honorary Rockets, as they are styled, ascended, was near 440 Yards: That three of these rose 526 Yards; and that the greatest Height of any of those fired in the grand Girandole was about 615 Yards: All reckon'd above the Level of the Place of Observation, which I esteem to be near 25 Yards higher than the *Green Park*, and little less than 15 Yards below the Chests whence the great Flight of Rockets was discharged.

It seems then there are Rockets which rise 600 Yards from the Place whence they are discharged: And this being more than a third Part of a Mile, it follows,

follows, that if their Light be sufficiently strong, and the Air be not hazy, they may be seen in a level Country at above 50 Miles Distance.

The Observations on the single Rockets are sufficiently consonant to some Experiments I made myself about a Fortnight since: For then I found that several single Pound Rockets went to various Heights between 450 and 500 Yards, the Altitude of the highest being extremely near this last Number, and the Time of their Ascent usually short of 7".

But though from all these Trials it should seem as if good Rockets of all Sizes had their Heights limited between 400 and 600 Yards; yet I am disposed to believe, that they may be made to reach much greater Distances. This I in some degree collect from the Nature of their Composition, and the usual imperfect Manner of forming them.

Nor is this merely Matter of Speculation; for I lately saw a dozen of four Pound Rockets fired; the greatest Part of which took up near 14" in their Ascent, and were totally obscured in a Cloud near 9 or 10" of the Time; so that the Moment of their bursting was only observable by a sudden Glimmering through the Clouds: And as these Rockets, during the Time they were visible, were far from moving with a languid Motion, I cannot but conceive, that the extraordinary Time of their Ascent must have been attended by a very unusual Rise.

IX. *Extract of so much of Don Antonio De Ullöa's F. R. S. Account of his Voyage to South America, as relates to the Distemper called there Vomito Prieto, or black Vomit. Translated from the Spanish by W. Watfon F. R. S.*

Read May 4. 1749. **T**HE City of *Cartagena* in *America*

is situate in 10 Degrees, 25 Min. 48 $\frac{1}{2}$ Seconds of North Latitude. The Weather there is always sultry hot. A Thermometer constructed by Mons. *de Reaumur* gave, on the 19th of *November* 1735. one of their Winter-Months, the Degree of the Warmth of the Air 1025 Divisions and a half; and this with little Variation, both Night and Day. The greatest Height to which the Spirit ascended at *Paris* the same Year, by a Thermometer graduated in the same Manner, was 1025 and a half; half; so that the Heat of the cool Nights at *Cartagena* was nearly equal to that of the hottest Days at *Paris*.

As the Heats in this Climate are so great, without receiving any sensible Mitigation from the Nights, it is no Wonder that the Perspiration of the Inhabitants is very great. From this it comes about, that all those who make their Abode there any time, appear pale and weakly, as though newly recovering from a Fit of Illness. You remark in all their Actions, even so far as in speaking, a certain Idleness, and, as our Author expresses himself, a Disjointedness: Notwithstanding this they are in good Health, though their Aspect indicates the contrary. The People who arrive there from *Europe*, hold the Appearance of Strength and Colour in their Countenances

nances during three or four Months ; but after that time they lose both one and the other from the Quantity of Sweat, until they become like the former Inhabitants. These Effects are most observable in younger People ; on the contrary, those who are farther advanced in Life, when they go thither, preserve their former Appearance better, and enjoy so good a State of Health, that they live commonly to more than eighty Years of Age.

As the Temperament of this Country is particular, so are some of its Distempers. These may be consider'd of two kinds; *viz.* those Distempers to which the *Europeans* newly arrived there are liable, and *they* only ; and those which are common to all Persons, as well *Criollos* as *Chapetones*.

The Distempers of the first Class are many, as the Resort of the *Europeans* there is very great. They are very dangerous, and often mortal. They frequently destroy a great Part of the People, both Sailors and others, who arrive there from *Europe*. The Continuance of these Distempers is very short ; they last but three or four Days, in which time the Sick either die, or are out of Danger. The particular Distemper, to which they are most liable, is very little known ; though it takes its Rise in some from taking Cold, in others from Indigestion ; but from whichever of these, or from what other Cause it takes its Rise, it becomes in the short time before-mention'd the *Vomito Prieto* or black Vomit, which is what kills them ; it being very rare that those, who have it, escape. It is observed in some, that their Delirium is so violent, that they are obliged to be tied down in their Beds, that they may not tear themselves in Pieces ; and they often die raving with the greatest Degree of Agony.

It is to be remarked, that those only are subject to this Distemper, who are lately arrived from *Europe*: The Inhabitants of the Country, as well as those who have abided there any time, are by no means liable to it, and enjoy perfect Health during its greatest Violence. As the Crews of Ships are very liable to this Distemper, and more so than the Officers and Passengers, who have greater Variety of Food and Liquor, it has been conceived, that the great Exercise and Labour of these People, and their feeding upon salt Provisions, prepares their Constitutions to be liable in this Climate to a Corruption of the Blood and Humours, from whence is supposed to proceed the *Vomito Prieto*. What must be observed is, that although the Crews of Ships suffer the greatest Slaughter, nevertheless Passengers and others, who go the Voyage under the greatest Advantages, with regard to the Conveniences of Life, are not free from being exposed to it. It must be remarked also, that those Persons, who, after having been used to this Climate, go from thence, and are absent even three or four Years, are not liable to it at their Return, but retain their Health like the other Inhabitants; although in their Way of living they have not observed the most exact Regimen.

The Desire of knowing the Cause of this terrible Calamity has occupied from time to time the Minds of the Surgeons who make this Voyage in the Galcons, as well as those of the Physicians of the Country; and their Opinion has been, that it chiefly takes its Rise from the Labour to which the Ships Crews are constantly exposed, and their Manner of living. There is no doubt but these may greatly contribute thereto;

thereto; but then it will be difficult to conceive, why Persons who are better circumstanced are likewise liable to it: And it is somewhat extraordinary, that, notwithstanding many Endeavours have been made towards finding out Remedies equal to this Disease, none have been discover'd, either as Specifics, or Preservatives; for the Inconstancy of the Symptoms is so great, that they are not in the Beginning to be distinguished from those which are in common to this with slighter Distempers; but the principal Complaints are at first a Weariness, and great Disorder in the Head.

This Distemper does not always attack the Ships of *Europe* at their Arrival in the Bay of *Cartagena*; nor is it very ancient in that Country; for what heretofore was called *Chapetonada*, so denominated, as those from *Europe* were only liable to it, were Indigestions: And though they were in that Climate always attended with Danger, the Women of the Country, as they do now, cured them with Ease, especially when they are taken in time. The Ships afterwards going from *Cartagena* to *Porto Bello*, it was there succeeded with the great Mortality, which was always attributed to the Unseasonableness of the Climate, and to the Fatigue of the Ships Crews in unloading their Ships, and in the Business of the Fair there.

The black Vomit was not known at *Cartagena*, nor in its Neighbourhood, until the Years 1729 and 1730, when first it carried off a great Part of the Crews of the Ships of War, which Don *Domingo Justiniani* then commanded, and were then there as *Guarda Costas*. These Ships were first attacked at

Santa Martha, where the Severity of this Distemper, and its great Slaughter, had cast a great Terror upon their Crews. The second Attack of this Distemper was on board the *Galcons* commanded by *Don Manuel Lopez Pintado*, when its Mortality was highly formidable, and Death follow'd the Attack so quick, that Persons, who were one Day seen walking at large, were next Day met carrying to their Graves.

Our Author is of Opinion, that this, as well as some other Distempers to which *Europeans* are liable at first, or soon after their Arrival at *Cartagena*, and other Places under the same Circumstances, should be consider'd as arising from the great Alteration that happens in their Constitutions there: And this Change, which from the Climate is soon brought about, makes them suffer this and other Distempers, which either destroy them, or generate in them a Disposition to bear the Heats; after which, being as it were naturalized, they enjoy the same Share of Health with the Natives.

Our Author remarks, that at *Cartagena*, when the Ships from *Spain* fail in their Arrival, the *European* Productions, which at all times are dear, and much valued there, are sometimes quite expended: These more particularly are Wine, Oil, and Raisins. When this is the Case with regard to Wine, the People there suffer much in their Health; as every body, except the *Nègroes*, and those who use Brandy, accustom themselves to drink it with their Food. From the Want of this, their Stomachs fail, they grow sick, and this Sicknefs becomes general. This Want of Wine happen'd when our Author arrived
at

at *Cartagena*, and the Sickneſs in conſequence was ſo general in that City, that Maſs was celebrated only in one of their Churches.

X. Declinationes quarumdam *Stellarum Australium* primæ et ſecundæ magnitudinis, menſe *Junio* 1738. cum methodo inveniendi horam in mari noctu, ex aſpectu *Crucis australis*; per Dn. de la Condamine, Reg. Societ. *Londin.* & *Acad. Reg. Scient. Pariſ.* Socium.

Read May 11. 1749 *Hæ* declinationes erutæ ſunt ex variis obſervationibus habitis e quadrante tripedali, menſibus *Junii* annorum 1737, 1738, et ſequentium, Quiti in *America* in latitudine $0^{\circ} 13' 16''$ australi, in loco ſcilicet 11 minutis ſecundis magis ad austrum ſito, ac locus obſervationis ſoliſtiorum Dec. 1736, et *Junii* 1737, cujus latitudinem in commen. ariolo meo de diſtantiâ tropicorum obſervata jampridem ſtatueram.

Notandum eſt præterea me in calculandis hiſce declinationibus uſum fuiſſe tabula reſractionum Petri Bouguer pro altitudine Soli *Quitienſis* quæ in commentariis Reg. Scient. Acad. pro anno 1738 inſerta eſt.

In navi *Argo* α *Canopus*. Stella primæ magnitudinis, et maxima fixarum uno Sinu excepto . . . 52 34 16

Quæ in brachio præcedenti seu occidentali			
<i>Crucis Australis</i> (<i>Bayero</i> γ) magnitudinis mediæ inter secundam et tertiam.	57	17	32
ζ in pede <i>Crucis</i> stella, quæ Polo australi maxime vicina est e quatuor stellis quibus crux constat, telescopio visa duplex apparet, nudo oculo simplex, et primæ magnitudinis	61	38	57
Quæ in vertice <i>Crucis</i> ϵ maxime <i>B</i> borealis secundæ magnitudinis, in brachio sequenti ξ secundæ magnitudinis	58	15	5
In pede <i>Centauri</i> præcedenti seu occidentali γ primæ magnitudinis	59	5	35
In pede sequenti <i>Centauri</i> α primæ magnitudinis	59	44	56

Jam pridem *Panamæ* observantes mense *Januario* anni 1736. animadverteramus repetitis vicibus addenda duo minuta prima* circiter declinationi stellæ *Canopi* in *Catalogo Britannico*, ut latitudo loci ex observationibus prædictæ stellæ illata cum latitudine ex altitudinibus solis collecta conveniret; quæ quidem annotatio omnibus subsequenter observationibus fuit confirmata, iisque nominatim quibus innititur antecedens *Canopi* declinatio; e quibus colligitur major duobus minutis primis, et duobus secundis, ea, quæ ex catalogo *Britannico* eruitur.

Hæ omnes stellæ, de quibus supra, lucidissimæ sunt, omniumque maxime spectabiles in hemisphœrio australi inter eas quæ in *Europa* non conspiciuntur.

In plerisque planisphæriis varie repræsentatur Crux australis, cujus situs, in his a Borea ad Austrum, in aliis ab *Euro-Borea* (N. E.) ad *Austro Zephyrum* (S. O.) dirigitur. Carta cœlestis partis cœli australis *Ignatii Pardies* schema Crucis australis exhibet duplex, unum scilicet in illa, alterum in hac directione, quarum prior vera est.

Crux itaque australis, cum in meridiano versatur, recta apparet, id est, horizonti perpendicularis, ideoque absque errore sensibili nautis inservire potest ad horam inveniendam, cognita differentia temporis inter transitum ipsius per meridianum ac solis, methodo sequenti ad praxim nautis facilem accommodata.

Ex repetitis observationibus ad annum præsentem 1749. redactis, colligo, quatuor minuta prima cum dimidio circiter interesse inter mediationem stellarum ζ et ϵ . in pede et capite Crucis australis, prioremque appellere ad meridianum minutis fere 13, postquam in boreali hemisphærio culminavit primum arietis punctum. Ex tabula igitur mediationis primi puncti arietis, qualem exhibet libellus qui singulis annis prodit in lucem sub titulo *Notitia Temporum* (*Connoissance des Temps*) hora vera noctu in mari facillime obtinebitur ex aspectu Crucis australis, attendendo qua hora Crux videbitur recta, et horizonti perpendicularis, seu potius, quando per tempus licuerit, filo, vel funiculo, appenso, pondere verticaliter tenso, et ex manu suspenso, observando illud momentum quo stellæ ζ in pede, et ϵ in capite *Crucis australis* hinc et hinc a perpendiculo æqualiter distare videbuntur. Hæc ex parte orientali, illa ex occidentali; nempe quo temporis puncto hæc fili positio obtinebit, vix uno minuto errabit in hora vera, addendo 15 minuta primæ,

prima, horæ mediationis primi puncti arietis, quæ ex prædicta tabula, emendata meridianorum calculatōris et observatoris differentia, concludetur.

Stella ζ in pede Crucis ideo maxima inter quatuor apparet, quod nudo oculo visa coalescit cum altera exigua, quæ quatuor aut quinque minutis secundis post illam appellit ad meridianum, quæ per telescopio observato australior est minuto cum 31 secundis; distantia micrometro mensurata.

Pes sequens sive orientatior *Centauri* α , stella primæ quoque magnitudinis, quæ capellam videtur æmulari, imo fulgore et magnitudine superare, etiam duplex est, constatque duabus stellis, quarum minor e majoris sinu emergere vix notatur optimo telescopio tripedali. Hæc etiam illa borealior est, ac paulo australior.

Ludovicus Feuilleus, qui unam et alteram telescopio 18 pedum observavit, majorem tertiæ, minorem quartæ magnitudinis statuit, quod propriis observationibus confirmare mihi non licuit; sed perperam idem auctor pedem *Centauri* in quo hæ duæ stellæ unæ conspiciuntur, Borealem nuncupat. Observata ab ipso *Feuilleo* anno 1710. die *Feb.* 26, in civitate *Conceptionis. Chileensis* ejusdem stellæ declinatione, quam 39 minutis majorem alterius pedis declinatione statuit.

XI. *A Letter from Mr. Emanuel da Costa F. R. S. to the President, concerning two beautiful Echinites.*

S I R,

Read May 11.
1749.

I HAVE the Honour of laying before you (in order to communicate to the *Royal Society*, if you think it worthy) the Description of two *Echinites*, or Stones moulded in fossil *Echini* Shells, hitherto undescribed, as far as I know.

These *Echinites* are undoubtedly moulded in Shells, of a *Genus* of which we at present find some Species now living in the Seas; mostly in the *West Indies*. The *Echinometra* of *Aristotle*, *Aldrovand*, and of *Dr. Grew* (a), is of this *Genus*. *Dr. Breynius* (b) calls the whole *Genus Echinanthus*; and *Mr. Klein* (c) *Scutum Woodward* (d), in his Distribution of fossil *Echini* calls them the *Pentaphylloides*, from the Rays on the upper Part forming a beautiful cinquefoil Figure; but wrongly fixes their Characteristics in having only one Aperture, and that at the Basis; in which he not only contradicts Nature, but also the very Specimens he quotes in his own Collection, which have all two *Foramens* or Apertures, and are elegantly figured so by *Agostino Scilla* (e) who was the Person that sent them to the Doctor; and

(a) *Museum Reg. Soc.* p. 139.
p. 60.

(b) *Schediasma de Echinis*,

(c) *Nat. Diss. Echinodermatum*, p. 29, TAB. 17.
A, et TAB. 18, B. (d) *Cade of foreign extraneous Fossils*, p. 16.
(e) *La vana Speculazione dissingannata dal senso*, TAB. 9, 10,
and 11.

and our late President Sir *Hans Sloane* (f) has also figured and described two Species of this *Genus*, whereof one Species is an Inhabitant of our *English* Seas.

I observed above, that, to my Knowledge, no Author has ever described *Echinites* or Stones moulded in the fossil. *Echini* of this *Genus*; nor even have the fossil *Echini* or Shells themselves been ever exhibited by any Lithologist, except by the above-quoted *A. Scilla*, who sent them to Dr. *Woodward*, and found them in *Malta*; to which the Doctor in his Catalogue recounts two other Specimens, which were dug up in *Maryland*; so rare are the Instances of the Fossils of this whole *Genus*!

The two *Echinites* here described (as also some few other Specimens of this sort, which I hear are in some Cabinets in this Metropolis) were all found in the midst of some Rocks, which were blown up at *Port Mahon* some Years ago, and from whence they were all brought.

The first or largest is in the Possession of the Right Rev. Dr. *Lavington*, Lord Bishop of *Exeter*; it is composed of a hard or stony arenaceous greyish Substance, and is of an Escutcheon or Heart-like Shape: It measures about $14\frac{1}{2}$ Inches in Circumference, or quite round the Limb or Edge, about two Inches high from the Flat or Basis to the Tip of the *Apex*, five Inches in Length at the Basis, and $4\frac{1}{4}$ in Breadth. On the upper Part it rises nearly gradually from the Edge quite to the *Apex*. A central Point, with a slight declining Space, tops the said *Apex*; from which
Space

(f) *Nat. Hist. of Jamaica*, Vol. 2. TAB. 242, Fig. 3. et seq.

Space the Body regularly divides into five Parts figured like Leaves to the Edge. These Leaves are narrow at the *Apex*, greatly widen toward the Bottom, and narrow a little again at their End. Each Division or Leaf is bounded on each Side by a Row of parallel Ridges, which are accompanied also on each Side of every said Row, with two other Ranges of Points or Knobs; all which Rows do not meet or close together at the lower End of the Division, but leave a void unwrought Space: A Row of larger irregular Knobs runs through the midst of each Leaf. From the Divisions between each Leaf runs a rugged knobb'd Pillar, which is join'd to the Edge: The other Parts between the Leaves and the Edge are Hollows, or void Spaces. The Edge or *Limbus* is of a thick cylindric Make, runs quite round the whole Body, and only has some Signs of being disjoined at the one Extreme of the Length, or where the Aperture was; the Stone answering which is here extended a little cylindrically outward like an Appendage, and was so formed by the stony Matter being too much in Quantity for the Shell, and so was protruded through the said *Foramen*. On the outer Edge of the *Limbus* are some few irregular stony Concretions. The Basis is flat, and is likewise divided into five Parts from the Center, which is one of the *Foramens*; the other *Foramen* (as has been above described) being placed at one of the Extremes of the Length. This *Foramen* or Center is about the Size of a Shilling. The five Divisions extend to the utmost Edge of the Body, or quite over the *Limbus*, contrary to the Divisions on the upper Part, which extend only to it. Each Division is formed by a stony Line edged on each Side with stony cylindrical

Bodies of the Thickness of a Pin, but of different Lengths, so as to appear like the Teeth of a Comb, or the Gills of a Fish; the Interstices between all which is a rugged stony Work, and Hollows pervading quite through the Body to the upper Part.

I cannot but think these five pectinated Divisions on the Basis, owe their Figure to some Parts of the included Fish; which I am more confirmed in, as I have seen some Specimens of the common pileated and galeated *Echinites*, which have been hollow'd at their *Apex*, and mark'd star-wise; that Concavity, and the stellar Mark proceeding from the Interposition of the Fish between the stony Matter then filling the Shell, and the Top of the Shell itself.

The other *Echinite* I have the Honour of producing before the Society, belongs to Mr. Edward Jacobs of Feverham. It is of a different Species, though of the same Genus, of a heart-like Shape, and about one third the Size of the above-described. This is greatly copped, the *Apex* lying very high, and the five Divisions running near perpendicularly down to the Edge. The upper Part of this is elegantly perfect; the Work is near the same as on the other; only that, by the Perfection this preserved is in, we observe that the Rows of parallel Ridges, which adorn each Side of each Leaf or Division, rise into a kind of arch'd Work or Bridge, made up of arch'd cylindrical Bodies, through which the middle Row runs, joined or connected in a long strait cylindrical Stem, in a most curious and elegant manner. The Basis or under Part of this Specimen is very imperfect, and only seems to differ in the Center being greatly excavated or concave, answering to the great
Copping

Copping or Height of the *Apex* or upper Part. This Fossil also consists of a hard stony arenaceous Substance like the other.

From the Inspection of the several Hollows of these *Echinites*, it is evident they were not immediately moulded in the Shells, but were so m'd in Cavities which those Shells formerly filled in the Rocks they were lodged in. The Rocks were apparently of a loosened arenaceous Texture, and the Water &c. continually pervading them, rotted and destroy'd the inclosed Shells, and bore away their whole Substance. In the same manner, and by the same means, were the stony Particles replaced into those very Cavities which the Shells formerly filled; consequently these Bodies were moulded exactly to the said Cavities.

This Remark carries a Conclusion with it, if Observation be made, that the Hollows and solid Parts of these Stones exactly answer to the Hollows and solid Parts of the very Shells themselves; which, had they been moulded in the very Shells; must have happen'd directly contrary; the solid Parts of the Shells forming Hollows in the Stone, and *vice versa*. In all sandy or lax earthy Matter fossil Shells are very seldom found, but only the moulded Stones; the loose Texture of those Substances giving free Access to Water, Vapours, and mineral Exhalations, &c. which intirely corrode and destroy the Shells buried in it.

I have taken the Liberty to produce before the Society a recent *Echinus* of this Genus from the *West Indies*, to elucidate my Subject; as also two Drawings done by Mr. Mynde; viz. of the Basis of

the large *Echinite*, and the upper Part of the small *Echinite* : All which are ingraved in TAB. IV.
I am, with Respect,

S I R,

London, April 27,
1749.

Your very devoted, and

obliged humble Servant,

Emanuel Mendes da Costa.

References to the Figures.

See TAB. IV.

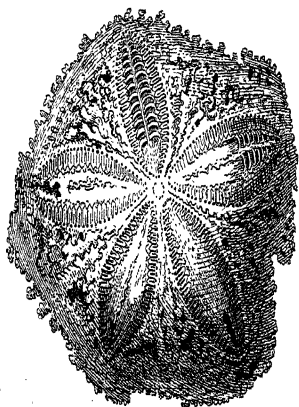
Fig. 1. A View of the upper Part of a curious Echinite, in the Possession of Mr. Edward Jacobs, of Feversham in Kent.

Fig. 2. A View of the under Side of the same Echinite.

Fig. 3. A View of the under Side of a curious large Echinite, in the Possession of the Right Rev. Dr. George Lavington, Bishop of Exeter.

N.B. The upper Part of this Echinite having nothing remarkably particular or different, it was not judged necessary to give a Figure of it.

Fig. 1.



p. 148.

Fig. 2.

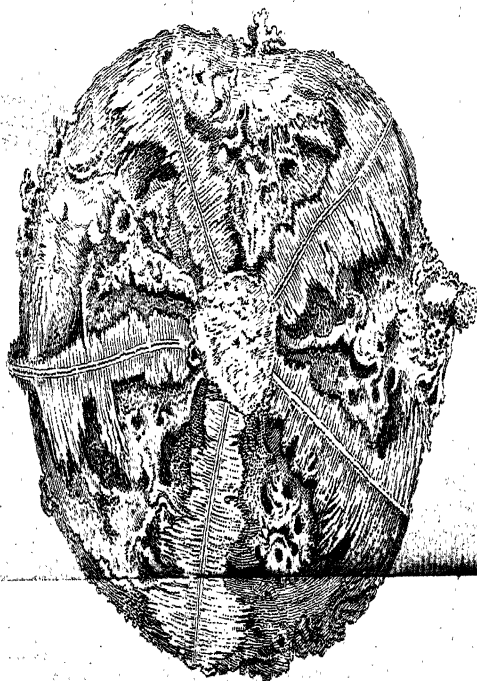


Fig. 3. p. 144.

J. Mynde sc.

XII. *The State of the Tides in Orkney; by Mr. Murdoch Mackenzie.*

Read May 25.
1749.

NO Accounts of the Flux and Reflux of the Sea were satisfactory, till Sir *Isaac Newton's* penetrating Genius deduced their true Cause from the Laws of Gravitation. His Principles carried such Conviction along with them, and gave such an easy Solution of some of the most remarkable *Phænomena*, that Mankind seem'd to imagine a thorough Knowledge of the Tides might be obtained from an attentive Consideration of the Principles he had established, without the Trouble of further Observations; but, as he, and all Philosophers since his Time, have consider'd only, or principally, the Influence of the Moon in elevating or depressing the Tides; their several Directions, Velocities, and other Affections, resulting from the Influence of Land, Shoals, and Winds, remain still as inexplicable, and as little known as ever.

As a distinct Knowledge of these Things is not only conducive to the Advancement of Science, but would greatly contribute to a convenient and safe Navigation, it may not be unacceptable to communicate such Remarks on the Tides about the *Orkney* Islands, as came under my Observation, while I was employed in surveying and navigating that and other adjacent Places; hoping it may incite others to explore the various Motions of that Element, on which such a considerable Part of the World are daily employed, in a more extensive and accurate manner than has yet been done.

From

From some Observations on the Tides in *Orkney*, I incline to think the Water begins to rise and fall sooner near the Shore than at a Distance from it.

When Spring-Tide is at its greatest Altitude, or Depression, the Water continues in a quiescent State near half an Hour: Neap-Tides continue so about an Hour and a half.

The Motion of the Water, both in Ascent, Descent, and Progression, is accelerated from the first to the fourth Hour, commonly; from the fourth to the last Hour its Velocity diminishes. This, however, admits of some Variation from the Influence of Winds.

The greatest Spring-Tides, and least Neap-Tides, are commonly on the third or fourth Day, after the Syzygies and Quadratures; but in this also the Winds have a considerable Influence; West and South west Winds making the greatest Floods, and least Ebbs; North and North east Winds, on the contrary, making the greatest Ebbs and least Floods in *Orkney*, and on the North Coast of *Scotland*. When Flood-Tide is raised higher than ordinary by Winds, the subsequent Ebb is not so low as it would have otherwise been. When a high Flood is raised by the Moon, the succeeding Ebb is proportionally low.

Ordinary Spring Tides rise 8 Feet perpendicular, ordinary Neap Tides $3\frac{1}{2}$; extraordinary high Spring-Tides rise 14 Feet; extraordinary low, only 5; extraordinary high Neap-Tides rise above 6 Feet; extraordinary small Neap-Tides not above 2. Low-water Neap-Tide, at a mean, I judge is about 3 Feet above Low-water Spring-Tide, and High-water Spring-Tide about 3 Feet above High water Neap-Tide: Yet the
Rise

Rise and Fall vary so much, that it would require a longer Course of Observations than I have had Opportunity of making, to determine what is most frequent in this Case.

When a Stream of Tide is interrupted by Land, or Rocks, or is confined within a Chancel, or long Arm of the Sea growing uniformly narrower, the Water will rise higher there than in neighbouring Places, where it is not so affected. If the Chancel, or Arm of the Sea, has several Windings, or Reaches, as they are called in the *Thames*, the superior Elevation will not be so considerable.

The following Observations of the Rising and Falling of the Water, were made in the Day-time, in the Bay of *Kirkwall*, anno 1748.

Augu. 8. Wind W. a Breeze. .

Last Quarter 4th Day. .

Moon's Apogee distant 24° . .

Moon's Declination 27° N.

Moon bearing at first W. by N.

			Feet	Inch.
The Water rose {	1 st Hour	.	0	$\frac{1}{2}$
	2 ^d	.	0	2
	3 ^d	.	0	$4\frac{1}{2}$
	4 th	.	0	$9\frac{1}{2}$
	5 th	.	0	$5\frac{1}{2}$
	6 th and to the End	.	0	$5\frac{1}{2}$

In all 2 . 5

[152]

August 15, Wind ENE. small Breeze.

New Moon 3d Day.

Moon's apparent Distance 65° .

Moon's Declination 7° S.

Moon bearing SSE.

		Feet	Inch.
The Water fell	1 st Hour	0	1 $\frac{1}{2}$
	2 ^d .	0	4 $\frac{1}{2}$
	3 ^d .	1	4
	4 th .	1	8
	5 th	1	5
	6 th	0	10

In all 5 9

August 13, Wind W. almost calm.

First Quarter, 3d Day.

Moon's Perigee distant 13° .

Moon's Declination 25° S.

Moon bearing E by N.

		Feet	Inch.
The Water rose	1 st Hour	0	6
	2 ^d .	1	0
	3 ^d .	1	8
	4 th .	1	0
	5 th .	0	8
	6 th .	0	7

In all 5 9

Aug. 29, Wind S^bW. Breeze at first, afterwards calm.

Full Moon 3d Day.

Moon's Perigee Dist. 68° .

Moon's

Moon's Declination 6° N.

Moon bearing NNW.

			Feet	Inch.
	1/2 Hour	.	1	0
	2d	.	0	10
	3d	.	1	4
	4th	.	1	2
	5th	.	2	10
	6th	.	1	0
In all				8 5

Aug. 27, Wind W S W. a small Breeze, the Day of Full Moon, Moon's Perigee Distance 36° , Decl. 4° S. bearing NNW. the Water fell in all 8 Feet 5 Inches perpendicular.

Aug. 30, calm, 4th Day after Full Moon, Perigee Distance 80° , Decl. 13° N. Moon bearing N by W. the Water rose 8 Feet 3 Inches.

Sept. 3, Wind S W. a small Breeze, first Day of the last Quarter, Apogee Dist. 50° . Decl. 27° N. Moon bearing W. the Water rose 6 Feet 1 Inch.

Sept. 6, Wind E. a small Breeze, 4th Day of the first Quarter, Apogee Dist. 15° Decl. 21° N. Moon bearing W. the Water rose 3 Feet 9 Inches.

Sept. 15, Wind S. a moderate Breeze, 5th Day after New Moon, Perigee Dist. 80° . Decl. 24° S. Moon bearing S by E. the Water fell 5 Feet 9 Inches.

To ascertain all the Varieties in the rising and falling of the Water, the Observations ought to have been continued much longer, the Night-Tides as well as Day-Tides observed; also the exact Times of

the Beginning and Ending of each, the Strength of the Wind and Weight of the Atmosphere by a Barometer.

The foregoing Articles relate to the Rising and Falling of the Water; the following to the various Motions of the Stream, and their Consequences.

On the Coast of *Orkney*, and *Fair Isle* of *Shetland*, the Body of the Flood comes from the North-west; on the East and West Coasts of *Lewis*, one of the Western Isles of *Scotland*, it comes from the South.

A League or two off the Coast, the Strength of the Stream is scarce sensible, except when it is confined by Land, or near Rocks or Shoals.

When the Tide begins to rise or fall on the Shore, about that same time the Stream near the Shore begins to turn or reverse its Direction, a few Irregularities excepted.

The Stream of Tide changes its Direction sooner near Land than at a Distance from it; insomuch that, in a Place two or three Miles from Land, the Turning of the Tide is two Hours, or more, later than on the adjacent Shore: At intermediate Distances the Streams turns at intermediate times. Hence a Vessel may find a favourable Tide near Land, while it would be against her a Mile or two from it; and the contrary.

During the Continuance of Flood, the Stream varies its Direction gradually from the East toward the South, and the Stream of Ebb from the West towards the North: That is, if the Stream, when it becomes first sensible, runs East, at the latter End of the

the Tide it will run South, if the Proximity of Land or Shoals does not hinder this Change of Direction.

The greatest Velocity of Spring Tide in *Orkney*, in the Channels where it runs quickest, is about 9 Miles an Hour: The greatest Velocity of Neap-Tide is about one third or fourth of Spring-Tide. The Tides are most rapid commonly between the third and fourth Hour. Spring-Tides acquire a considerable Degree of Strength in less than one Hour after their quiescent State begins; Neap-Tides are hardly sensible in two Hours after.

In similar Streights or Channels, lying in the same Direction, and supplied from the same Part of the Ocean, the Velocity of the Streams will be in the direct *Ratio* of the Breadth of the Inlets, and the Inverse of the Outlets.

If a Sound, or Streight between two Islands, or Continents, lies in the Direction of the main Body of the Tide, the Velocity of the Stream in that Streight will be greater (all other things alike) than in any other adjacent one, not lying in that same Direction.

If an Island lies directly in the Tide-way, the Stream will divide, or split, before it reaches the Island, into two Branches, one of which will run toward one Side or End of the Island, and the other toward the other End of it; and, in passing by, will be reflected a little from the Land. Hence a Vessel, in a Calm, carried along with a strong Stream of Tide, is in no Danger of touching an Island, or visible Rock, if the Water is deep enough near them.

If the Tide runs stronger, or more obliquely, by one End of an Island than the other, from the strongest Stream, and from the most oblique, there will be a

languid Current toward the other ; that is, the Tide, along that Side of the Island, will set longer one Way than the other.

If a strong Stream of Tide runs across the Mouth of a Bay that does not reach far into the Land ; within that Bay there will be a slow Stream setting the contrary Way. Or, if a strong Stream sets directly, or nearly so, along the Extremity of a Point, or Promontory, that stretches strait out from the Coast, between this Stream (before it reaches the Point) and the Coast, there will be a languid Current with a contrary Direction. By attending to this, one Vessel may keep her Course, or gain a Port, while another is carried away with the Tide.

If a small Island lies thwart a Tide-way, that Part of the Stream which runs along one End of it, will join what runs along the other, at some Distance beyond the Island, inclosing between them a curved Space, within which there will either be no sensible Current, or a slow one, contrary to the other Streams. The counter Current, in the middle of this almost stagnant Space, or Eddy, when it gets near the Island, splits in two ; one Branch of which runs towards one Extremity of the Island, the other towards its other Extremity ; where meeting the stronger direct Streams that form the Eddy, are by them again carried towards its *Vertex*.

These Eddies may be of great Service to Ships or Boats, by sheltering them from a rapid Stream, or even carrying them against it ; or may enable them to cross it with more Advantage, according to the different Places to which they are bound. The Opposition of the contrary Tides
bounding

bounding the Eddy, makes that Part of the Sea rougher in blowing Weather, and of a darker Colour in Calms, than the rest, by which the Limits and Direction of these Eddies are always distinguished.

The Collision of the opposite and obliqu. Streams, near the Ends of the Island, will excite a circular Motion in the Water, and, if the Celerity of the Tide is considerable, will occasion Whirlpools, or Cavities in the Sea, in Form of an inverted Bell, wide at the Mouth, or at the Surface of the Sea, and growing gradually narrower toward the Bottom: Their Width and Depth are in proportion to the Rapidity of the Streams that cause them, and are sometimes so large as to be dangerous. Those in *Petland Firth*, near the Islands *Stroma* and *Swona*, may, with Spring-Tide, turn any Vessel quite round, but are never so large as to endanger one otherways: There have been Instances, however, of small Boats dropping into, and being swallowed up by them. The *Hiatus*, or Cavity, is largest when it is first formed, and is carried along with the Stream, diminishing gradually in Dimensions as it goes, until it quite disappears. The Suction, or spiral Motion communicated to the Water, does not seem to extend far beyond the *Hiatus*. I passed, in a Boat, within 20 Yards of one, without being sensible of any Attraction; but indeed it was toward the latter End of the Tide, when its Strength was much abated: The Diameter of the Cavity, at that time, I judged to be between two and three Feet. When Fishermen are aware of their Approach toward a Whirlpool, or Well, as it is called in *Orkney*, and have Time to throw an Oar, or any other bulky Body into it before they
are

are too near, the spiral Motion is interrupted, and the Continuity of the Water broke; which, rushing in on all Sides, immediately fills up the Cavity, and enables them to go over it safe. Hence in blowing Weather, or when there is a breaking Sea, tho' there may be a circular Motion in the Water, there can be no Cavity.

When there is a steep sunk Rock near the Concourse of such strong Tides, and not very deep below the Surface, a most amazing *Phænomenon* will happen: For, the Stream being interrupted in its Course, and falling suddenly over the Rock, is reflected from the Bottom upwards, swelling and bubbling on the Surface like boiling Water, and carrying Sand, Shells, Fishes, or other loose Bodies along with it; which, with Boats, or whatever else is near, are driven with great Force from the Center all around toward the Circumference, upon which, a Gyration of the Water ensuing, a Whirlpool begins, which is carried along with the Stream, as was said above, lessening gradually till it is quite extinguished: In a little time a new Eruption and Ebullition, like the former, begins, which proceeds in the same manner, till the Swiftness of the Stream abates, or the Tide rises or falls too much above the Rock,

Queries concerning the Tides in a large Ocean; which, if resolved from Observation, would render the Theory more perfect.

1. Since the Attraction of the Moon raises the Water directly below her, by diminishing its Gravity toward the Earth's Center, and, at that very
same

same time, depresses it at a Quadrant's Distance, by augmenting the Gravity there, so that the superior Altitude of one Part of the Ocean is immediately balanced by the superior Gravitation of another; do not, therefore, the Tides in the Ocean rise and fall without any progressive Motion, or sensible Velocity? And do not all Currents, or Streams of Tide (not caused by Winds) proceed from the Interruption which Land, or Shoals, give to the undulatory Motion which must accompany the perpendicular Ascent or Descent of the Fluids?

2. Is it agreeable to Observation, that the Power of the Sun and Moon together, raises the Tides within the Tropics about 14 Feet, as *Newton*, *Halley*, and *Maclaurin* suppose? And how high are the Tides found to rise in Parts of the Ocean of a greater Latitude? If the Water does not rise and fall so much within the Tropics, as in Places more distant from the Equator, what hinders the greater Power to have a greater Effect? For the Moon must act with greatest Force on those Parts to which she is vertical.

3. If the Times of high and low Water depend on the Moon's Appulse to the Meridian, is it not high or low Water in all Parts of the Ocean, under the same Meridian, about the same time? And is the Difference of the Times, in Places under different Meridians, in any certain Proportion to their Difference of Longitude?

4. Since the Power of the Moon to raise the Tide in any Place is greatest when she is nearest the Zenith, it is agreeable both to Observation and Theory, that the Water rises and falls more when she is above, than when below the Horizons of Places on the same
Side

Side of the Equator with her; and the contrary: Are not the Tides also of longer Duration in that Case? Since a greater Portion of the Hemispheroid, into which the Sea is formed by the Moon's Attraction, is then above the Horizons of these Places, than is below them. If this is found to be Fact, it will also be found, that the Duration in different Places (other things alike) will be in some measure proportional to their Latitudes, and the Declination of the Moon.

5. In an oblique Sphere, all Azimuth Circles cut the Equator and its Parallels obliquely; and therefore the Moon must come sooner to, or from, a given Azimuth, with one Declination than with another. In some Latitudes this Difference will amount to several Hours. Is it not then a false Rule to judge of the Times of high or low Water by the Moon's Azimuth, or to signify one by the other, as is the Custom of Sailors?

XIII. *Some Account of the Remains of John Tradescant's Garden at Lambeth; by Mr. W. Watson F. R. S.*

Read May 25. 1749. UPON a Visit made to Mr. *John Tradescant's* Garden at *South Lambeth*, May 21, 1749. by Dr. *Mitchell* and myself, were observed the under-mention'd exotic Plants.

This Garden was planted by the above-mention'd Gentleman about an hundred and twenty Years since, and was, except that of Mr. *John Gerard*, the Author of
of

of the Herbal, probably the first botanical Garden in *England*. The Founder, after many Years spent in the Service of the Lord Treasurer *Salisbury*, Lord *Wotton*, &c. travell'd several Years, and procured a great Variety of Plants and Seeds before not known in *England*; to several of which at this time the Gardeners give his Name, as a Mark of Distinction; as *Tradescant's Spiderwort*, *Tradescant's Aster*, *Tradescant's Daffodil*. He first planted here the *Cupressus Americanus Acaciæ foliis deciduis*, which has been since so much esteem'd, and is now one of the great Ornaments of the Duke of *Argyll's* Garden at *Witton*.

Mr. *Tradescant's* Garden has now been many Years totally neglected, and the House belonging to it empty and ruin'd; and though the Garden is quite cover'd with Weeds, there remain among them manifest Footsteps of its Founder. We found there the *Borrigo latifolia semperwrens* of C. B. *Polygonatum vulgare latifolium* C. B. *Aristolochia clematidis recta* C. B. and *Dracontium* Dod. There are yet remaining two Trees of the *Arbutus*, the largest I have seen; which, from their being so long used to our Winters, did not suffer by the severe Colds of 1729 and 1740, when most of their kind were kill'd throughout *England*. In the Orchard there is a Tree of the *Rhamnus catharticus*, about 20 Feet high, and near a Foot in Diameter, by much the greatest I ever saw.

It is not unlikely but there may be several other Plants yet remaining in the Garden, but flourishing at a different Time of the Year.

W. Watfon.

XIV. *A Letter from the Rev. Mr. Richard Dunthorne to the Reverend Mr. Richard Mafon F. R. S. and Keeper of the Woodwardian Museum at Cambridge, concerning the Acceleration of the Moon.*

S I R,

Cambridge, Feb. 28, 1748-9.

Read June 1.
1749.

AFTER I had compared a good Number of modern Observations made in different Situations of the Moon and of her Orbit in respect of the Sun, with the *Newtonian* Theory, as in my Letter of Nov. 4, 1746; † I proceeded to examine the mean Motion of the Moon, of her Apogee, and Nodes, to see whether they were well represented by the Tables for any considerable Number of Years, and whether I should be able to make out that Acceleration of the Moon's Motion which Dr. *Halley* suspected. *Vide* Phil. Transf. n. 218.

To this End I compared several Eclipses of the Moon observed by *Tycho Brahe*, as they are set down in his *Progymnasmata*, p. 114, with the Tables*, and found them agree full as well as could be expected; considering the Imperfection of his Clocks, and the Difficulty there must commonly have been in determining the Middle of the Eclipse from the Facts observed, as published in his *Historia Cœlestis*. Indeed the small Distance of Time between *Tycho Brahe* and

† See these Transact. No. 482. p. 412.

* My Tables corrected as in my former Letter; which is always to be understood of the Tables mention'd in this.

and *Flamsteed* render'd *Tycho's* Observations but of little Use in this Enquiry.

The next Observations that occurred to me were those of *Bernard Walther* and *Regiomontanus*, which being at double the Distance of Time from *Flamsteed* that *Tycho's* were, seemed to promise some Assistance in this Matter: Upon comparing such of their Eclipses of the Moon whose Circumstances are best related with the Tables, I found the computed Places of the Moon were mostly 5' too forward, and in some considerably more, which I could hardly persuade myself to throw upon the Errors of Observation; but concluded, that the Moon's mean Motion since that time, must have been something swifter than the Tables represent it; though the Disagreement of the Observations between themselves is too great to infer any thing from them with Certainty in so nice an Affair.

Then I compared the four well-known Eclipses observed by *Albategnius* with the Tables, and found the computed Places of the Moon in three of them considerably too forward: This, if I could have depended upon the Longitude of *Araçta*, would very much have confirmed me in the Opinion, that the Moon's mean Motion must have been swifter in some of the last Centuries than the Tables make it; though the Differences between these Observations, and the Tables, are not uniform enough to be taken for a certain Proof thereof.

I could meet with no Observations of Eclipses to be at all depended upon between those of *Regiomontanus* and *Albategnius*, except two of the Sun and one of the Moon made at *Cairo* in *Egypt*,

related in the *Prolegomena* to *Tycho Brahe's Historia Cœlestis*, p. 34; nor any between those of *Albatagnius* and *Ptolemy*, besides the Eclipse of the Sun observed by *Theon* at *Alexandria*; notwithstanding I carefully searched all the Remains of Antiquity I could find with that View. These Eclipses of the Sun are the more valuable, because they were observed in Places the Longitudes and Latitudes whereof are determined by Monsieur *Chazelles* of the *Royal Academy of Sciences*, who was sent by the *French King* in the Year 1693, with proper Instruments for that Purpose. *Du Hamel Hist. Acad.* p. 309, 395.

The solar Eclipse observed by *Theon* was in the 112th Year of *Nabonassar* the Day of *Thoth*, according to the *Egyptians*, but the 22d Day of *Pauni*, according to the *Alexandrians*: He carefully observed the Beginning of 2 temporal Hours and 50' Afternoon, and the End at 4½ Hours nearly Afternoon at *Alexandria*. *Theonis Comment. in Ptol. mag. Construct.* p. 332. This Eclipse was June 16, in the Year of Christ 364: And the temporal Hour at *Alexandria* being at that time to the equinoctial Hour as 7 to 6, makes the Beginning at 3 equinoctial Hours and 18' Afternoon, and the End at 5 equinoctial Hours 15' nearly.

The Eclipses observed at *Grand Cairo* were as follows.

“ Anno Hegiræ 367, die *Jovis*, qui erat 28, rabie
 “ posterioris (is est ordine mensis quartus, et incipit
 “ ille annus *Saracenicus* die 19 *Augusti*, anno *Christiano* 977) observatum fuit *Cahiræ* in *Ægypti*
 “ metropoli initium eclipsis solaris, cum altitudo solis
 “ effect

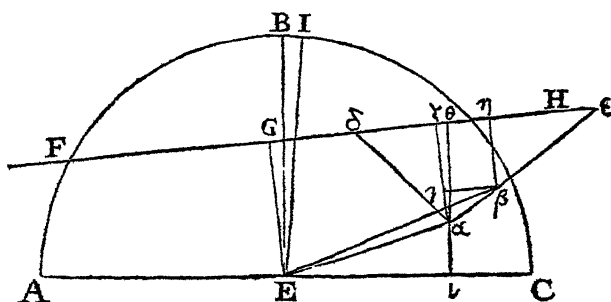
“ effet 15ⁿ 43'. quantitas obscuracionis 8 digit. Ea
 “ finita, sol elevabatur 33½ gr. *Ex Schickardo in*
 “ *MS.*” This Eclipse was *Decemb. 13*, in the
 Year of Christ 977, the Beginning at 8^h 25', and the
 End at 10^h 45' apparent Time in the Morning.

“ Anno eodem die Sabbathi, videlicet 29 mensis
 “ *Sywal* (numero decimi, qui Paschalis est eorum)
 “ eclipsis Solis occupavit digitos 7½. In principio
 “ Sol altus fere 56°. In fine Sol occiduus elevaba-
 “ tur gradibus 26. *Ex Schickardo in MS.*” —
 This Eclipse was *June 8*, in the Year of Christ 978.
 The Beginning at 2^h 31', and the End at 4^h 50'
 apparent Time Afternoon.

“ Anno Hegiræ 368 (qui incoepit die 9 *Augusti*,
 “ anno *Christiano* 978) die *Jovis*, 14 *Sywal*, Luna
 “ fuit orta cum defectu, qui ad 5½ digitos accrevit;
 “ cum extaret supra horizontem gradibus etiam 26
 “ subaudio finem tunc accidisse). *Schickardus.*” —
 This Eclipse was *May 14*, in the Year of Christ 979;
 but as the Middle cannot be known from what was
 observed of it, I made no use thereof in this Enquiry.
 The Account concludes with the following Para-
 graph:

“ Hæ tres observationes habitæ sunt ab *Ibn-Funis*,
 “ qui jussu Regis *Abu-Haly Almanzor*, sapientis,
 “ *Ægypto* tunc Imperantis, rebus vacabat coelest-
 “ tibus. Hujus authoris tabulas habet *Jac. Golius*
 “ Professor *Lugdun.* (qui mihi inde communicavit
 “ ista) in quibus plures aliæ, sui et superioris ævi ob-
 “ servationes extant. Locus observationis propinquus
 “ urbi *Cabiro.* *Schickardus.*”

That the before-mention'd solar Eclipses might be applied to the Examination of the Lunar Motions, I contriv'd the following Method ; which I think renders Eclipses of the Sun as useful at least as those of the Moon are in that Business.



Let ABC in the annexed Figure represent half the Earth's enlightened Disk, AEC a Portion of the Ecliptic projected thereon FGH the Path of the Moon's Shadow over the Disk, EI , the universal Meridian, α the Situation of the Place at the Beginning of the Eclipse, β its Situation at the End thereof, δ the Centre of the Shade at the Beginning, and ϵ its Centre at the End of the Eclipse. Draw EG , $\alpha\zeta$, and $\beta\eta$, perpendicular to the Path of the Shadow, $\beta\gamma$ parallel thereto ; join $\alpha\delta$ and $\beta\epsilon$, and through α draw $\theta\alpha$ perpendicular to AC .

Then (computing the true Places of the Sun and Moon at the observed Times of the Beginning and End of the Eclipse) we shall have given $\delta\epsilon$ the Motion of the Moon from the Sun in her Orbit during the Time of the Eclipse, and $\alpha\delta = \beta\epsilon$ the Semidiameter of the *Penumbra* ; which are to be reduced into such Parts as the Semidiameter of the Disk contains

tains 10000: The Angles BEI and BEG , being found by Methods commonly known, GEI their Sum or Difference will be likewise given. Also $E\alpha$ and $E\beta$ will be Sines of the Sun's Altitude at the Beginning and End of the Eclipse respectively; $IE\alpha$ and $IE\beta$ are the Angles at the Sun between the Vertex of the Place and the Pole of those Times; which being found, the Angle $\alpha E\beta$, their Difference will be known, from whence the Line $\alpha\beta$ and the Angle $E\alpha\beta$ may be computed.

The Angle $GE\alpha$ is the Sum or Difference of the known Angles GEI and $IE\alpha$: In the Figure before us, the Complement of this to a Semicircle is $E\alpha\gamma$; which being subtracted from $E\alpha\beta$ leaves the Angle $\gamma\alpha\beta$, from whence and the Line $\alpha\beta$, $\alpha\gamma$, and $\gamma\beta = \zeta\eta$ may be found.

Let $a = \delta\epsilon = \zeta\eta$, $b = \alpha\delta = \beta\epsilon$, $c = \alpha\gamma$, and $x = \beta\eta = \gamma\zeta$.

Then $\sqrt{bb - xx} = \eta\epsilon$, and $\sqrt{bb - cc - 2cx - xx} = \delta\zeta$, by *Euc.* 1.47.

Consequently $a - \sqrt{bb - xx} = \sqrt{bb - cc - 2cx - xx}$ which being reduced, gives us the quadratic Equation $xx + cx = \frac{4a^2b^2 - a^4 - 2a^2c^2}{4aa + 4cc}$. This Equation solved, gives us the Value of x , from which $\delta\zeta$ and $\eta\epsilon$ will be likewise had. In the Triangle $\alpha\zeta\theta$ we have $\alpha\zeta$ and the Angle $\zeta\alpha\theta = GEB$ given, whence $\alpha\theta$ and $\zeta\theta$ may be found: Consequently $\delta\theta$ will be known; and from the observed Time of the Beginning of the Eclipse, and hourly Motion of the Moon from the Sun, the Time when the Centre of the Shade is at θ will be had. Lastly, in the Triangle $E\alpha\iota$, we have given the Side $E\alpha$, and the Angle $E\alpha\iota = BE\alpha$

BE α (the Sum or Difference of the Angles BEI and IE α); therefore the Sides E ι and $\alpha\iota$ may be found. But E ι is the Distance of the Moon from the Sun in the Ecliptic, and $\alpha\iota$ \propto θ the Moon's Latitude at the Time when the Centre of the Shade is at θ ; which may be compared with the Computation from the Tables for that Time.

By this Means I compared the aforefaid Solar Eclipses with the Tables, and found the Difference in Longitude and Latitude, as follows.

A.D	Apparent Time at Greenwich.	Dist. D a \odot from E ι .	Lat. ρ from θ .	ρ a \odot by Tab.	Lat. ρ by Tab.	Diff. from Obser.		Diff. in Lat. from Digits observed.
						n Long	in Lat.	
364	June 16. 2 4 20 ^h	39 41 in conseq.	34 37 Nor	35 25 37	26 Nor.	-4 16	+2 49	
977	Dec. 12. 19 12 30 ^h	43 39 in antec.	30 23 Nor.	36 3 31	50 Nor.	+7 36	+1 27	- 2 36
978	June 8. 1 16 10 ^h	29 3 in conseq.	8 24 Sou.	37 48 3	21 Sou.	+8 45	-5 3	+ 3 38

The Agreement there is between the two last of these Differences in Longitude, shews that the Tables represent the mean Motion of the Moon's Apogee very well for above 700 Years, the Moon being very near her Perigee at the Time of one of those Eclipses, and near her Apogee at the Time of the other.

By the same Method I also compared the Sun's Eclipse, *July 29, 1478.* (which appears, from what is related of it, to have been carefully observed by *Bernard Walther* at *Nuremberg*), with the Tables, and found the Difference in Longitude to be + 10' 29'', and in Latitude + 9' 12''. This wide Difference in Latitude, from the Tables, that agree so well with the former ancient Observations, confirmed me in the Opinion, that the *Nuremberg* Obser-

Observations are too inaccurate to determine any thing from them in this Affair.

The Eclipses recorded by *Ptolemy* in his *Almagest*, are most of them so loosely described, that, if they shew us the Moon's mean Motion has been accelerated in the long Interval of Time since they happened, they are wholly incapable of shewing us, how much that Acceleration has been. There are indeed two or three of them attended with such lucky Circumstances as not only plainly prove, that there has been such an Acceleration, but also help us to guess at its Quantity. One of these is the Eclipse, said by *Hipparchus* to have been observed at *Babylon*, in the 366th Year of *Nabonassar*, the Night between the 26th and 27th Days of *Thoth*, when a small Part of the Moon's Disk was eclipsed from the North East, half an Hour before the End of the Night, and the Moon set eclipsed. This was in the Year before Christ 313, *Decemb. 22*. The Middle of this Eclipse at *Babylon* (supposing with *Ptolemy* the Meridian of that Place to be 50' in Time East of the Meridian of *Alexandria*), by my Tables was *Dec. 22. 4^h 4' apparent Time; the Duration was 1^h 37', *Ptolemy* makes it 1^h 30' nearly; whence the Beginning should have been about 8^h 15' after Midnight: According to *Ptolemy*, the Night at *Babylon* was at that Time 14^h 24' long, and therefore Sun-rise at 7^h 12' after Midnight; and as the Moon had then South Latitude, and was not quite come to the Sun's Opposition, her apparent Setting must have been something sooner, *i. e.* more than an Hour before the Beginning of the Eclipse, according to the Tables; whereas the Moon was seen*

Y

eclipsed

eclipsed some Time before her Setting; which, I think, demonstrates, that the Moon's Place must have been forwarder, and consequently her Motion since that Time less than the Tables make it by about 40' or 50'. But the computed Place of the Moon in each of the before-mentioned Solar Eclipses observed at *Grand Cairo*, being about 8' before her Place, from Observation shews us, that the mean Motion of this Luminary has been something greater in the last 700 Years than the Tables suppose it, and therefore must have been accelerated.

This Acceleration is further confirmed by the Eclipse, which *Hipparchus* says was observed at *Alexandria*, in the 54th Year of the second *Calippic* Period, the 16th Day of *Messori*, when (he says) the Moon began to be eclipsed half an Hour before her Rising, and was wholly clear again in the Middle of the third Hour of the Night. This was in the Year before Christ 201. *Sept. 22.* The Middle of this Eclipse at *Alexandria* by the Tables was *Sept. 22. 7^h 44'* apparent Time; and the Duration 3^h 4', which makes the Beginning at 6^h 12' apparent Time, that is, about 10' after the rising of the Moon at *Alexandria*, or 40' later than the Beginning from Observation. This Difference in Time makes a Difference of near 20' in the Moon's Place.

The most antient Eclipse of which we have any Account remaining, namely that related by *Ptolemy*, to have been observed at *Babylon* the first Year of *Mardokempad*, in the Night between the 29th and 30th Days of *Thoth*, in which the Moon began to be eclipsed when one Hour after her Rising was fully past; if, by reason of the Latitude of the Expression,

pression, it be not a direct Proof of the Acceleration, it may nevertheless help to limit its Quantity. This Eclipse was in the Year before Christ 721. *March* 19. The Middle whereof at *Babylon*, by the Tables, was *March* 19. 10^h 26' apparent Time; and the Beginning at 8^h 32', the apparent Rising of the Moon at that Place was about 5^h 46' Afternoon; so that the observed Beginning of the Eclipse was at least 6^h 46' Afternoon, *i. e.* not above 1 $\frac{1}{4}$ ^h before the Beginning, by the Tables: Wherefore the Moon's true Place could precede her Place by Computation but little more than 50' at that Time.

If we take this Acceleration to be uniform, as the Observations whereupon it is grounded are not sufficient to prove the Contrary, the Aggregate of it will be as the Square of the Time: And if we suppose it to be 10'' in 100 Years, and that the Tables truly represent the Moon's Place about *A. D.* 700. it will best agree with the before-mentioned Observations; and the Difference between the Moon's Place by the Tables and her Place in the Heavens, will be as follows.

Years before Christ.	Error of Tab.	Years of Christ.	Error of Tab.	Years of Christ.	Error of Tab.
700	—56 6	200	—12 30	1100	+ 4 0
600	—49 50	300	— 9 20	1200	+ 4 10
500	—44 0	400	— 6 30	1300	+ 4 0
400	—38 30	500	— 4 0	1400	+ 3 30
300	—33 20	600	— 1 50	1500	+ 2 40
200	—28 30	700	0 0	1600	+ 1 30
100	—24 0	800	+ 1 30	1700	0 0
A. D. O	—19 50	900	+ 2 40		
100	—16 0	1000	+ 3 30		

I am,

S I R,

Your humble Servant,

Richard Dunthorne.

XV. Alberti Halleri, *Archiatri Reg. Medicin. Prof. Gotting.* & R. S. Lond. *S. Fabricæ morbosæ in cadaveribus repertæ historię aliquæ.*

O B S. I.

Read, June 8. 1749. **I**N femina quadragenaria reperi Venam cavam inter renalis sinistra originem, et inter iliacas venas, enormiter angustatam, ut vix quid-

quidquam transmitteret. Aliquid tamen polyposis duri sanguinis in ejus cavitate, quæ inter crassas membranas arctissima fuit, repertum est: Vena vero spermatica dextra enormiter dilatata, unciali diametro venæ cavæ locum subiit, et sanguinem, exclusum a via solita, reddidit ureteris venæ, alioquin in sano corpore exiguæ, ortæ ab iliaca dextra.

Rarissimi hujusmodi coalitus exemplum aliud reperi in *Johannis Rhodii Mantiss. Anatom. Obs.* XXI.

Ex utroque constat, etiam in maximis truncis vatorum corporis humani morbos subnasci posse, et obstructionem in venis vere dari; et canales minimos, quando sanguinis, solitis viis exclusi, impetus eo vergit, patentissimos reddi posse.

O B S. II.

In femina decrepita, quam centum annorum ætate esse dicunt, non tamen ita firma fama, ut eam sequi tuto liceat, ætatis summæ aliqua vestigia reperi.

Tota corporis fabrica durior fuit, vel cultro judice: glandulæ conglobatæ sanæ, sed similes fere renalis carnis firmitati; nervi præduri; cellulosa tela ubique vix scissilis; costarum cartilagine nonnullæ, nisi supremam velles, quæ cum sternone, nexu vix ullum discriminis vestigium relincente, conferruminata erat: sed in ea costa id non rarum est.

Verum in arteria magna mortis causæ fuerunt. Amplissima primum aorta, qua ex corde prodit, ut quinque unciarum et linearum duarum esset ambitus. Deinde aperto hoc, non aneurysmate quidem, sed amplissimo tamen sinu, adparuit.

(1) Val-

(1) Valvulas cordis arteriosas, partim induratas, partim etiam petrosi humoribus varias esse, perinde ubi *Cowteri* fere figuram demonstrant, [*Mythol. reform. Tab. XL.*] Reliquæ valvulæ venosæ artēriosa cordis vix mutata.

(2) In arteria aorta tum ad cor, tum in thorace, in abdome denique, membrana interna undique lacera, quasi scabendo in eminentes cristas, liberas, fluctuantes, mutata, tanquam ulcere aliquo consumta esset. Hæ squamæ passim ossæ erant, alicubi etiam petrosæ, et acervi tophaceorum granorum plerorumque vasorum ex aorta oriundorum ostia obsidebant. Membrana musculosa sana fuit, tum externa, ut vitium omne in intima federet.

(3) In hypogastricis, iliaticis, pelvis arteriis, et iis quæ ex pelvi ad nates exeunt, plurimæ crustæ ossæ, subflexiles tamen, in quas mutata erat interna harum arteriarum membrana, ita tamen adhærentibus fibris carneis, ut passim calculosæ squamæ ductibus transversis inscriberentur; nihil tamen hic petrosi: In omnibus arteriis corporis prædura et figurata, teretia sanguinis crassamenta, suo canale tamen minora.

(4) Vesicula fellea flava bile, vix amara, plena, et calculis ad viginti, exiguis, angulosis, quorum unus ita obsidebat ostium ductus cystici, propius paulum choledochi, quam prima cystici valvula, ut bilis, contra quam solet, ex vesicula premendo expelli non posset. Dulcedinem in bile, quando in calculos coivit, plerumque reperire soleo.

Hæc fere fuerunt, quæ observationem mererentur, et demonstrant arteriarum internam membranam ab ictibus repetitis cordis tandem partim indurescere, partim inter ossificata spatia rumpi, sic debilitari

bilitari truncum aortæ, et ad aneurysmata reddi primum. Demonstrat etiam, in ipso sanguine ubique terram veram calculosam circumvehi, nec in renalibus solum viis deponi, sed ibi hære et congeri, ubi ruptæ sunt levissimæ membranæ vasorum, et attractio terrearum molecularum ad asperas inæquales superficies major est.

XVI. *A Memoir on the Lacrymæ Batavicæ, or Glass-Drops, the tempering of Steel, and Effervescence, accounted for by the same Principle. By Claud, Nic. le Cat, M. D. F. R. S. &c. Translated from the French, by T. S. M. D.*

Read June 15. *749. **T**HE Glass-Tear, or Drop, commonly called *Lacryma Batavica*, or *Lacryma Borussica*, because it was first made in these Countries, is much celebrated among Natural Philosophers, upon account of the singular Phenomena which it exhibits, and which have for a long Time exercised their Sagacity.

The Make of this Drop is as simple as its Explanation is difficult. It is the Work of the meanest Workman in a Glass-house. On the Top of an iron Rod they take up a small Quantity of the Matter of Glass in Fusion: They let it drop into a Pail of Water: The Drop makes that Part of the Water which it touches, to boil with a hissing Noise, as a red-hot Iron would do, which it resembles in that Instant; and when it does not break in this Operation,

ration, as it most frequently does, it forms the little pyramidal Mas, which is known by the Name of a Glas-Drop; the Effects whereof I will first relate, and then endeavour to account for them.

Experiment 1. This Drop is of such Hardness and Resistance, that it bears smart Blows of a Hammer, without breaking.

Exper. 2. Nevertheless, if you grind the Surface of this Drop which resisted the Hammer, or if you only break the Tip of the small End or Tail, the Whole shatters into Powder.

Exper. 3. This Shattering of the Drops is attended with a loud Report; and the Dust or Powder to which it is reduced, shoots out, and scatters all around.

Exper. 4. If the Drop be ground with Powder of Emery, imbibed with Oil, it often escapes breaking.

Exper. 5. If this Experiment be made in the Air-Pump, the Drop bursts with greater Impetuosity, so as sometimes to break the Receiver and its Dust is finer than when done in the open Air; and if it be made in the dark, the Drop in bursting produces a little Light.

Exper. 6. If this Drop be annealed in the Fire, it loses all these Singularities; and being reduced to the State of common Glas, it easily breaks under

der the Hammer; and does not burst upon breaking the small End.

Exper. 7. The Drops that are made by letting them cool in the Air, produce no other Effects than those which have been annealed.

The first natural Philosophers who endeavoured to investigate the Cause of these Phænomena, imagined that they found it in the Air. Some of them supposed, that this Air was shut up in the Drop by the Crust which the cold Water forms on its Surface while it is yet red-hot; and attributed its Rupture to the Violence with which this Air issued thro' the too narrow Passage made for it, in breaking the small End of the Drop. Others maintained on the contrary, that the Drop, in this State, contained no Air at all, nor any thing but Particles of Fire, or subtile Matter; or, in one Word, a Vacuum of Air; and that the sudden bursting of the Drop was occasioned by the impetuous Entry of the Air into this sort of Vacuum. In fine, the *Cartesians* have substituted their subtile Matter in the room of this exterior Air, and say, that the Drop is bursted by the less subtile Particles of this Matter; which entering with Force into the Drop by the Opening made therein, and finding large Pores on the Inside, and small ones on the Outside, burst the Sides of the Drop, by rushing from the Centre to the Circumference, wherewith its Passage is obstructed.

Mess. *Mariotte* and *Homburg* came afterwards; Being provided with an Air Pump, they caused one of these Drops to be broken *in Vacuo*; and *Homburg*

berg having observed, that it broke therein better and with a louder Report than in the open Air; they both inferred, that neither the impetuous Entry of the outward Air, nor that of a Fluid somewhat less gross, could be the Cause of this Shock; because the Receiver of the Air-Pump is void of these Fluids; and even if a little should remain therein, it is too much rarefied, and too thin to be capable of such an Effect.

Mr. *Mariotte*, tho' some Remains of Attachment to an Opinion, which he had held to that Time, did not intirely exclude the exterior Air from the Cause of the Phænomenon of the Drop; but thought proper to add another to it; which he makes use of as a Substitute in Cases like those of the preceding Experiment, where the Insufficiency of the Air, or of a Fluid nearly similar to it, plainly appears.

Mr. *Homburg* shews no Indulgence to the exterior Fluid; and ascribes the Whole to the new Cause, which is, the Quality of temper'd Glass, which the Drop acquires, like Steel, by being thrown red-hot into cold Water. This Tempering, according to these great Academicians, confers at the same time more Springiness to the Parts, and less Connection with each other. When a Steel Sword-Blade is bent forcibly, it breaks more easily than one of Iron; and the Jarring which is occasioned by its Spring, is capable of breaking the other Parts of the Blade: And thus we see, that it generally breaks into several Pieces. This Blade is the Image of the *Lacryma Batavica*, or Glass-Drop.

This is the Point to which I found Things brought, when I began to study the Phænomena of the Glass-Drop.

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The Air was partly banished from the Inside of this Mass of Glass: There is none in the liquid red-hot Matter of a Glass Furnace. It was purely out of Complaisance for a generally received Opinion, that Mr. *Mariotte* allowed the exterior Fluid any Share in the Phænomenon; and Mr. *Homburg* put the finishing hand to its Exclusion. But the Sort of Temper given to the Drop by plunging it red-hot into cold Water, and its Comparison with temper'd Steel, is not so much a Cause as a Comparison: And moreover, is this Comparison very just? Can there be any between a long, thin Sword-Blade, which breaks into two or three Pieces, and a thick inflexible Mass of Glass, which flies into Powder. The Tail alone of the Drop might seem to favour this Parallel: But an Experiment, which I made, entirely destroys this Opinion, and proves, that it is not the Spring, or the Vibrations of the Parts of the Drop, that occasion its bursting.

I put about half the Tail of a Glass Drop into a Vice between two Bits of Deal-board of about a Finger's Breadth. I screw'd the Vice, till I saw this small Cylinder or Thread of Glass make Impressions in the Wood on each Side for its Lodgment, in order to be sure that it could not be susceptible of Vibrations. In this Condition I broke the End of the Tail, supporting it on my Nail, to prevent forcing any Part but the End which I intended to break; and in order to be the more certain of giving no Shock to the Part that was squeezed in the Vice. My Drop flew into Powder as usual; and the Portion secured between the two Bits of Wood, perfectly retained its Figure in the Impressions wherein

it was lodged. But when I touch'd this little Cylinder, it was reduced to Powder, much in the same manner as is said to have happen'd to some Men who had been struck with Lightning. Now, it was not possible for this Glass to receive, or convey to the Body of the Drop any Vibrations; or if any, they must be infinitely small; and yet the Effect was precisely the same as usual. Therefore the System of Vibrations is not happier than those invented before it.

It is among the Glass-workers, and in their Art, that the Secret of the *Lacryma Batavica*, or Glass-Drop, is to be sought; and there it is that I think I have discover'd it.

All those who have seen Glass-houses know, that when a Piece fails in the Hands of a Workman, he throws it aside; and this Piece is not long exposed to the Air, before it breaks in Pieces: And when the same Workman has succeeded in making a Piece, and is willing to preserve it, he takes great Care not to let it cool in the Air; but carries it hot into another Oven of a moderate Heat, where he leaves it for a certain Space of Time. And this last Operation is called *Annealing the Glass*.

A natural Philosopher, who is Witness to this Management, ought to inquire into the Reasons and Necessity of it.

How comes it that the Glass, which cools in the Air, breaks; and when it has been nealed, it does not break? This is the Reason, if I am not mistaken.

A Bit of melted Glass, red hot and liquid at the same time, is in that State, purely because its Particles are divided by so great a Quantity of Particles
of

of Fire, or subtil Matter so violently agitated, that these component Parts of the Glas do hardly touch one another: They swim, if I may be allowed the Expression, in a Flood of this Matter of Fire; and for this Reason it is, that melted Glas affects the Colours of Flame.

When this Substance is exposed to the Air, the Coolness of this Fluid, which touches the Surface of the Glas, cools that Surface first; that is, brings the Particles nearer together, braces their Pores, and thus imprisons the Particles of Fire, which still fill the Inside of this Substance. While these fiery Particles find Pores enough on the Surface, to move freely, the Glas continues whole; but when the Glas grows colder, that is, when the Pores of its Surface begin to confine these fiery Particles; then their whole Action is exerted against the Parts of the Glas, which they break into a thousand Pieces. In order to avoid this *Fracas*, nothing more is requisite than to keep the Pores on the Surface of the Glas wide enough, that the fiery Particles contain'd therein may pass through, and fly off insensibly. Now, this is what is done, by putting the hot Piece of Glas into an Oven, the moderate Heat of which keeps these Pores open to a certain Pitch, and yet allows the Glas to acquire its due Consistence in this State of middling Porosity: Wherein consists the Annealing of Glas and other fused Substances.

Hence it appears, that all unnealed Glas carries within itself its Principle of Destruction, which is the Matter of Fire imprisoned. But the *Lachryma Batavica*, or Glas-Drop is in this respect, in a worse Case still than unnealed Glas: For besides that it has not been exposed to this secondary Heat,
which

which keeps its Pores open, till the Glass has acquired its due Consistence, for Fear that the Coldness of the Air alone should not close its Pores soon enough, and imprison a sufficient Quantity of the igneous Matter, it is suddenly thrown into cold Water, which by its Coldness and Weight is fitter than the Air to produce such an Effect speedily and effectually. Wherefore the only surprising Circumstance in these Glass-Drops is, that any of them remain without breaking, by the great Quantity of igneous Matter suddenly shut up in them by the cold Water. And indeed this Accident befalls more than one half of them; and those that escape, doubtless owe their Preservation to the spherical or cylindrical Figure of the compact Shell, which the Coldness of the Water forms on their Surface: For it is well known that this Figure produces an Equality of Resistance on all Sides, which considerably encreases the resisting Force: And this is the first Reason why, as soon as this *Æquilibrium* is broken, either by rubbing away one Side of this Surface, or by making a Hole in it, or, in fine, by breaking the small End of the Drop; the Resistance is instantly overcome, and the igneous Matter, imprisoned within the Glass, and constantly upon the Strain against it, bursts it into Powder.

This destroyed *Æquilibrium* is but one Disposition that favours the Effect of the imprison'd igneous Matter: But the Communication which is opened for it with the subtile exterior Fluids, rouses this Matter which is in a State of Inactivity, develops its Spring, kindles it somewhat in the Manner of the Phosphorus, which produces no Effect while close shut

shut up, but takes Fire, as soon as a free Communication with the outward Air is given it.

On the Union of these Causes depend the Phenomena of the Glass-Drop. It is of a Hardness that resists the Strokes of a Hammer, because the violent Condensation, given to its Surface by the cold Water, into which it was thrown when in a soft State, render'd its Texture very close, compact, and consequently hard.

It bursts with great Noise; and in so doing it retains the Character of all the Effects produced by the Explosion of the igneous Matter.

Its Dust flies two or three Feet all around, because it is push'd forward by the Action of a Fluid contained in its Centre; which would not happen, if it had been the Effect of an exterior Fluid. This same Dust of the Glass-Drop darts forward with greater Force in the Air-Pump than in the Air, because the Air is an Obstacle, of which it is freed in the Receiver of the Air-Pump: Wherefore it sometimes breaks the Receiver; and for the same Reason its Dust is finer, that is, more minutely broken, as being done by a stronger Power, and less counter-balanced.

This violent Explosion produces Light, because the Property of shining Lightning is always the Effect of such an Explosion of the Matter of Fire: Wherefore this Fact affords another Proof, that this Matter is the Principle of the Phenomenon of the Drop.

If the Surface of the Drop be ground with fine Powder of Emery, imbibed with Oil, it frequently happens, that it does not burst; because the Sort of oily Mastic that results from this Mixture, stops the Pores

Pores of the Drop, and prevents the sudden Communication of the exterior Fluids with the imprisoned igneous Matter ; and as Glass cannot be ground with very fine Emery and Oil, but by long rubbing ; such rubbing heats the Drop, and gradually opens the Pores so as to grant an insensible Passage to the igneous Matter, whereby the Drop becomes at last in the same Case with nealed Glass ; and in the Case in which itself is, when it is put into the Oven to be nealed.

When a Glass-Drop is made, by suspending it in the Air only, it does not break sooner than nealed Glass : Because as this small Mass of Glass retains its Heat a long while in the Air, the Heat serves as a Nealing-Oven, and keeps its Pores dilated long enough for the igneous Particles to find a free Passage.

The Principles, by which I have accounted for the Effects of the Glass-Drop, are not confined to this Phenomenon alone : They are more general than is commonly imagined. Some Corollaries, which I shall deduce from them, will prove what I advance.

The Tempering of Steel.

Steel, like the Glass-Drop, acquires its Hardness by being plunged into Water : And if Mess. *Mariotte* and *Homburg* had compared them together in this Circumstance alone, they had been in the right.

The most celebrated natural Philosophers, in order to account for the tempering of Steel, have had recourse to different Arrangements of its Parts produced by the Fire, and fixed, by the Cold of the Water, in the new State, in which the violent Heat had put them.

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The Mechanism of the tempering of Glass Drops, applied to that of Steel, is the the most simple of all the Hypotheses, and answers all its Properties, which are these :

1. Tempered Steel has a coarser Grain. 2. Is increased in Bulk. 3. It is harder and brittler. 4. By annealing it becomes less brittle.

Explanation. Steel made red-hot is filled and swelled, and its Pores dilated, by the igneous Matter. In this State, the cold Water, into which it is thrown, compresses and closes the Parts of the Surface, while the imprisoned igneous Matter dilates the Pores within : Thus the Texture of Steel becomes more compact by these two Causes, while its Pores are dilated.

These large Pores constitute the coarse Grain of tempered Steel. Its Dilatation by the igneous Matter, which could not be thoroughly condensed by the Cold of the Water, causes its augmented Bulk : The close Texture of the Substance that surrounds the Pores, and the imprisoned igneous Matter, occasion its Hardness and Brittleness. Its Recoction or Annealing deprives it of this Brittleness, and of a Part of its Hardness : Because it opens this Texture, which it relaxes at the Expence of the neighbouring Pores, and drives the igneous Matter out of it.

Fermentation.

The Fermentation of Acids and Alkali's seem, to be another Corollary of the same Principle.

First, It is pretty universally allowed, that the acid Particles have the Figure of small Needles; and that Alkali's are spheroidal or polyhedrous Bodies with a vast Number of Bodies proper to admit the acid Needles.

Secondly, Experience shews, that Salts are alkalised by Fire, and that our Juices are alkalised by Heat, &c. What can the repeated Action of the Fire produce on Salts, in order to alkalise them? It calcines them, blunts their Points, and hollows them with a vast Number of Pores; and we see with the naked Eye, that Calcination has this Effect on all Bodies. In a word, it converts an angular very solid Body into a very porous and light Spheroid; and this Body is an Alkali by the first Supposition.

Thirdly, Calcination introduces, and generally leaves in the Pores of the calcined Body, after the Operation, a great Quantity of igneous Matter. This Matter is perceptible to the Senses in the *Lapis Bononiensis*, which becomes a Phosphorus by Calcination; in Lime-Stone, which by Calcination is furnished with so great a Quantity of igneous Matter, that in the Effervescence, which is raised in it by throwing a little Water on this Stone, you may kindle Sulphur or a Match by it. The Alcaline, or alcalized Salts also, that is, those which are calcined, have their Pores full of the igneous Matter.

Fourthly, Such is the Nature of the igneous Matter, that it tears asunder whatever opposes its Passage,

sage, and makes it fly off with a Report. This Principle is universally allowed: The Effects of Gunpowder, of Volcano's and Earthquakes, prove it: And to come nearer our Subject, unnealed Glass breaks in the Air, and the *Lacryma Batavica* does as much upon breaking its small End.

Whereas an Alkali is a spongy Body filled with the igneous Matter, and an Acid are Points proportioned to these Pores; these ought to be regarded as so many Pegs or Pins, which enter into the Holes on the Surface of the Alkali, and fill them up exactly: Whereby the igneous Matter is imprisoned; and by the preceding Principle it bursts the alkaline Globule with Noise, and scatters around the acid Pegs, in the same manner as it burst the Glass-Drop.

A Mixture of an alkaline and acid Liquor being composed of an infinite Number of such Particles that burst and broke to Pieces, the Liquor must take up more room, or swell. The Particles of Air therein contained, being tossed about by all those little Explosions, together with the neutral Liquors, which are a Vehicle to the Salts, form the Scum or Froth; and the igneous Matter, which gets out of the Alkali's, and is agitated by the Shocks of all these Explosions, produces Heat, drags with it the aqueous and other volatile Particles, which form the Steam.

Yet there are cold Fermentations, because then, either the Motion of the Particles of Fire, and their *Fracas*, is inconsiderable; or because these Particles fly off easily by a direct Motion. Moreover, at this Day that we have it in our Power to be convinced, that the *Pruss* or Stream of electric Matter is very

cold, nobody will be surpris'd, that a Stream of the Matter of Fire may. produce Cold.

If all the alcalious Corpuscles burst'd at once, the Fermentation would last but an Instant : But as the acid Liquor requires a certain Space of Time, to penetrate the whole alkaline Liquor, and fill the Pores of the alcalious Corpuscles, the Fermentation is performed successively in a certain Number of Corpuscles at a time, until they are all broken: And this Succession constitutes the Duration of the Fermentation; which ceases when there are none of the Alkali's left entire.

These Principles not only serve to explain the Fermentation, which results from the Mixture of Acids and Alkali's, but also almost all the Motions of this Kind, which are occasioned by the Mixture or Penetration of two or more Substances.

For Example; Lime, which we have mentioned above as a Body filled with the Matter of Fire, and which produces an Effervescence capable of lighting Sulphur, if Water be thrown on it; Lime, I say, produces this Effect, only because the Particles of Water, which enter into its Pores, have a Tendency to shut up the igneous Particles more closely. It is by a Mechanism entirely similar, that *Homborg's* Phosphorus kindles into Flame, upon being expos'd to the Air: 'Tis upon this Principle likewise, that a Mixture of Spirit of Wine and Water acquires a new Degree of Heat; and so of other Phænomena of this Nature.

———— Le Cat.

XVII. *Extract of a Letter from Mr. Prof. Geo. Matthias Bose, of Wittemberg, to Mr. W. Watson, F. R. S. on the Electricity of Glass, that has been exposed to strong Fires.*

Dated *March* $\frac{2}{12}$, 174 $\frac{8}{9}$.

* * *

Read April 6. 1749. **I**T seems to me that a Glass Ball, which has oftentimes been employed for violent Distillations, and other chymical Operations, does send forth the Electricity incomparably more strong than any other Glass, which never since its making had been exposed to a violent Fire. As I am the first that has mentioned this notable Circumstance, be pleased to let me have the Honour of this Improvement in the Philosophical Transactions.

* * *

ERRATA.

Nº. 490. p. 583. l. 12. for 10 *Miles* r. 8 *Miles*.

Nº. 492. p. 38. for *cistitome* r. *cystitome* ; and the same
where-ever the Word occurs.

PHILOSOPHICAL TRANSACTIONS.

For the Months of *Octob. Nov. and Dec.* 1749.

- I. *A Description of an extraordinary Rainbow observed July 15, 1748. by Peter Daval, Esq; Secret. R. S.* p. 193
- II. *A Letter from Mr. Henry Baker, F. R. S. to the President, containing an Extract of a Letter from Mr. William Arderon, F. R. S. to Mr. Baker, giving an Account of the present Condition of the Roman Camp at Caistor in Norfolk, with a Plan of it; and also a Representation of an Halo or Mock-Sun observed by the same Gentleman July 11, 1749.* p. 196
- III. *Part of a Letter from Leonard Euler, Prof. Math. at Berlin, and F. R. S. To the Rev. Mr. Caspar Wettstein, Chaplain to his Royal Highness the Prince of Wales, concerning the gradual Approach of the Earth to the Sun. Translated from the French, by T. S. M. D. F. R. S.* p. 203
- IV.

The CONTENTS.

- IV. *Part of a Letter from Mr. Benj. Cooke, M. R. S. to Mr. Peter Collinson, F. R. S. concerning the Effects of the Mixture of the Farina of Apple-Trees; and of the Mayze or Indian Corn: And of a Child born with the Jaundice upon it, receiv'd from its Father; and of the Mother taking the same Distemper from her Husband, the next Time of being with Child.* p. 205
- V. *A Letter from the Rev. Henry Miles, D. D. and F. R. S. to Mr. Henry Baker, F. R. S. concerning a very cold Day, and another a very hot Day, in June and July 1749 and of the near Agreement of Thermometers in London and at Tooting.* p. 208
- VI. *Account of a Bas-relief of Mithras found at York, explain'd by the Rev. Dr. Stukely, F. R. S. communicated to the Royal Society, by Mr. Francis Drake of York, F. R. S.* p. 214
- VII. *Part of a Letter from James Mounsey, M. D. Physician to the Czarina's Army, to Mr. Henry Baker, F. R. S. concerning the Russian Castor, the Baths at Carlsbad,*
the

The CONTENTS.

the Salt-mines near Cracau, and various other Notices. p. 217

VIII. *The Case of a Lady, who was delivered of a Child, which had the Small-Pox appeared in a Day or two after its Birth; drawn up by Cromwell Mortimer, M. D. Secret. R. S.* p. 233

IX. *Some Accounts of the Fœtus in utero being differently affected by the Small Pox. By W. Watson, F. R. S.* p. 235

X. *The Case of Nicolas Reeks, who was born with his Feet turned inwards, which came to rights after being some time used to sit cross-legged. Transmitted from William Millner, Esq; at Poole, to Sir Peter Thompson, Knt. F. R. S.* p. 239

XI. *A Letter from Mr. James Short, F. R. S. to the President, with the Description and Uses of an Equatorial Telescope.* p. 241

XII. *An Eclipse of the Moon, observed at Mr. Graham's in Fleet-street, by John Bevis, M. D. and Mr. James Short, F. R. S.* p. 247

XIII. *An Account of an extraordinary Meteor seen in the County of Rutland, which resembled*

The CONTENTS.

- resembled a Water-Spout, communicated to the President by Tho. Barker, Esq; p. 248*
- XIV. *An Enquiry into the original State and Properties of Spar, and Sparry Productions, particularly the Spars or Crystals found in the Cornish Mines, called Cornish Diamonds. In a Letter to Emanuel Mendez da Costa, Esq; F. R. S. from the Rev. Mr. Wm. Borlace. p. 250*
- XV. *A Description of the Great Black Wasp, from Pensilvania, as communicated from Mr. John Bartram to Mr. Peter Collinson, F. R. S. p. 278*
- XVI. *An Observation of an Eclipse of the Moon, Dec. 12. 1749. made at Earith, near St. Ives, in Huntingdonshire, by Mr. Wm. Elstobb, jun. communicated in a Letter to Martin Folkes, Esq; Pr. R. S. p. 280*
- XVII. *A Catalogue of the Eclipses of Jupiter's Satellites for the Year 1751. by James Hodgson, F.R.S. and Master of the Royal Mathematical School in Christ's-Hospital, London. p. 282*
- XVIII. *A Letter from the Widow of the late Mr. John Senex, F. R. S. to the President, concerning his large Globes. p. 290*

I. *A Description of an extraordinary Rainbow observed July 15, 1748. by Peter Daval, Esq; Sec. R. S.*

Read Oct. 26, 1749. UPON Monday the 18th of July 1748. about a Quarter before Seven in the Evening, the Weather being temperate, and the Wind about N. N. W. as I was walking in the Fields, beyond *Islington*, I saw a distant Rainbow which appeared to take in a large Portion of the Heavens; but had nothing remarkable, and vanish'd by degrees.

Continuing my Walk, about twenty Minutes after the Disappearing of the first Rainbow, a rainy Cloud cross'd me, moving gently with the Wind, which exhibited to me a more perfect and distinct Rainbow, than I had ever before seen; wherein I could plainly distinguish all the secondary Orders of Colours taken Notice of by the late Dr. *Langwith* in his Letters to Dr. *Jurin* published in the Philosophical Transactions*, that is, to say, within the Purple of the common Rainbow, there were Arches of the following Colours.

1. Yellowish Green, darker Green, Purple.
2. Green, Purple.
3. Green Purple.

**Vid. Phil. Transf. No. 375. from Page 241 to 245. Ab. Transf. (Lemas and Martin) Vol. 6. p. 122, 123.*

This innermost arch Dr. *Langwith* calls faint vanishing Purple, and I likewise found, that it sometimes appear'd and disappear'd alternately; but during about two Minutes it seem'd to me to be as permanent as any of the other Colours.

I stood still, and look'd attentively at this Appearance, during the whole Time of its Continuance, which was near eight Minutes, and could for the greatest Part of that Time discern all the above-mention'd Colours, except the innermost Purple in the upper Parts of the Bow; but could not distinguish any of them in those Parts of it which were near the Horizon, tho' they were extremely vivid, as was likewise the outer Bow, in which the Colours appear'd as bright, tho' not so well defin'd, as in most inner Rainbows I had seen.

As I had read Dr. *Langwith's* Letter a short time before I saw this beautiful Appearance, and as I compared his Account with what I had seen, the same Evening, and again the next Morning, I can the better be assur'd of the exact Agreement of our Observations.

On my first seeing this Phænomenon, I was surpris'd, that the Diameter of the Bow appear'd to me very small, compar'd with that I had seen a little before. The Occasion of this I think must have been, that the Legs of the first-mention'd Bow appeared to me to terminate at distant Places: Whereas in the latter Appearance I could plainly see both Ends of the inner and outer Bows terminated in the neighbouring Fields, at a very small Distance from each other: Hence, and from my being involv'd in the Shower which occasion'd this Rainbow, I conclude
it

it was very near me; which might be one Cause of the great Vividness of its Colours, and of my distinguishing the inner Arches. But whether this was the only Cause of those Appearances, or whether they might not be owing to some particular Disposition of the Atmosphere at that Time, I much question: As well because I have often seen Rainbows which have been very near me, and oppos'd to a bright Sun, whercin I could not discern these inner Orders of Colours, as that I have heard from some intelligent Persons, that some very bright Rainbows were seen soon after the Solar Eclipse which happened on the 14th of *July* 1748. particularly that an unusually vivid and distinct Rainbow was observ'd at *Twickenham* three or four Days after that Eclipse, which agrees with the Day on which I saw the above-mention'd Appearance.

- II. *A Letter from Mr. Henry Baker, F. R. S. to the President, containing an Extract of a Letter from Mr. William Arderon, F. R. S. to Mr. Baker, giving an Account of the present Condition of the Roman Camp at Castor in Norfolk, with a Plan of it ; and also a Representation of an Halo or Mock-Sun observed by the same Gentleman July 11, 1749.*

S I R,

London, October 26, 1749.

Read Nov. 2.
1749.

I TAKE the Liberty to lay before you an Account lately sent me by my ingenious Correspondent Mr. *William Arderon, F. R. S.* of the present Condition of the *Roman Camp at Castor*, in the County of *Norfolk*, together with a Plan or Drawing of the same, taken by himself upon the Spot, in the Month of *June* last : At which Time he went thither on purpose to examine it. As this Camp is a remarkable Piece of *Roman Antiquity*, and I have always found Mr. *Arderon* extremely accurate in his Observations and Descriptions, they may I hope be thought deserving your Notice. I take likewise this Opportunity of presenting you the Account and Representation of an *Halo*, or Mock-Sun, seen by the same diligent Observer on the 11th Day of *July* last.

Permit

Permit me, at the same Time the Honour of assuring you that I am with the greatest Respect,

S I R,

Your most obedient humble Servant,

H. BAKER.

The Extract of a Letter from Mr. Ardron to Mr. Baker.

Dear Sir,

IN Consequence of my Promise to you I have been at *Castor*, to view the present Condition of that celebrated *Roman* Camp, whose venerable Ruins appear there; and I now send you the best Description of it my Observations can furnish out. Indeed when I made such Promise, I little thought how difficult a Task I had undertaken, and how easily the most skilful in these Matters may be mistaken, amidst ruinous Heaps and Vestigia nearly effaced by Length of Time. However, I can assure you, no Care or Caution has been wanting, and the plain Truth shall be related with all the Exactness possible.

The Town of *Castor* is at present in a very low Condition, containing no more than between twenty and thirty small Cottages. It stands about four Miles South-west of *Norwich*, and by Tradition, and some learned Authors, is supposed to have been a considerable City, out of whose Ruins *Norwich* took its Rise. *Skinner* says, in his Etymologicon, "*Castor in Com. Norf. olim VENTA ICENORUM: ex cujus Ruinis orta est Norwich civitas.*" However, at this Day (excepting the Camp) not the least Trace or Footstep of any-thing remarkable is left remaining.

The

The Camp itself lies near a Furlong South-west from the Town of *Caſtor*, and leads you by a gentle Deſcent down to the little River *Wentſum*, which ſwiftly glides cloſe to the End thereof, and no Doubt, at the firſt forming of the Camp was deſigned to be Part of the Fortification on that Side, as well as to ſupply the Army with Water, and to bring up ſuch Things as they wanted from the Sea, if ſo be their Communication by Land ſhould at any Time be impeded. What confirms me in this Opinion, is a large Staple and Ring of Iron, which I myſelf have ſeen on the Side of the Tower that ſtands near the River ; tho' now I find that curious Monument of Antiquity is taken away. However, on my Suppoſition, this River muſt have been much larger at that Time than it is at preſent, or it could have been of little Uſe for Water-carriage, from the Smallneſs and Shallowneſs of its Stream.

This River by ſome is called *Taus*, or *Teſe* : But I imagine it did not formerly take that Name until it approached the *Roman* Camp at *Teſeburgh*, three or four Miles higher.

We are told by Tradition, as well as by ſome learned Authors, that the Sea came up to this Camp ; and indeed every intelligent Obſerver muſt confeſs, that the Marine Bodies found in every Part of *Norfolk*, on the higheſt Hills, as well as in the loweſt Pits and Valleys, are indubitable Proofs, that at ſome Time or other the Sea muſt have covered this whole County : But then we may be aſſured, by the preſent Condition of this Camp, that the Sea hath not exceeded the Level of it ſince it hath been in Being, which, if we credit ſeveral of our antient Hiſtorians, it was up-
wards

wards of 1700 Years ago. It may, therefore serve to prove, that the Sea since that Time has not exceeded these Bounds, and that the Fossils dug up above this Level are more antient than it, tho' we have no proper *Data* to discover how long before, the Sea had passed this Height.

I have been pretty exact in examining the Situation of this Camp, imagining the two Sides had pointed due East and West, and the two Ends North and South : But I find they differ from it full ten Degrees, after allowing for the Variation of the Needle : Whence it is plain the Meridian of the Place must have altered better than half a Degree each Century to the Westward, provided the Situation of the Camp was placed due North and South when it was first formed. But possibly the *Romans* might not be exact as to the Points of the Compass, or perhaps this Variation was at first dispensed with to accommodate the Camp to the natural Declivity of the Ground. These Difficulties however may better be cleared up, if some ingenious Gentlemen would take the Trouble to examine some other *Roman* Camps in different Parts of this Kingdom, to discover whether the *Romans* paid a strict Regard to the disposing of their Camps with their Sides to the four cardinal Points of the Compass, which I think it will nearly amount to a Demonstration that they did, if they are found to agree with this Camp at *Castor* in its Variation from due North and South.

The Figure of the Camp is not a Square (as it is described by most Authors who have writ upon it) but a Parallelogram, whose two longest Sides are each 440 Yards, and its Ends or two shorter Sides

360 Yards each. These are its Dimensions without-side the Rampart and Ditch ; but within-side the said Ditch and Rampart the Length is 392 Yards, and the Breadth 264. I measured the Breadth of the Fosse and Rampart, which I found in some Places, where it remains most perfect, to be 48 Yards, tho' in others not above 30. And according to my Computation the whole Ground taken up, including the Ditch and Rampart, is 32 Acres, 2 Rood, and 36 Pole ; or the Area within the Ditch and Rampart 21 Acres, 1 Rood, 21 Pole.

At about three or four Furlongs North-west of the Camp rises a Ridge of Hills, appearing something like a second Rampart, and descending gradually to the Camp. These Hills add greatly to the Prospect, and must have been no little Advantage to the Safety of the Place, as a constant Watch might be kept thereon to prevent any Surprize ; nor could an Enemy advance nearer than the Summit of these Hills without being exposed to the View of the whole Camp.

Three Sides only of this Camp have been fortified with a Rampart, whose upper Part was faced with a thick and strong Wall made of Lime and Flints, of which Wall there are still Remains in several Places of the Rampart, besides a very deep Ditch that seems to have been most considerable on the East and South Sides.

The Wall on the North Side appears to have been built at two different Times ; that is, it seems to have been raised higher than it was built at first, at some Distance of Time afterwards ; for a Parting may be observed at a certain Height running from End to End.

The

The Ruins of two old Towers still remain, one of which stood on the North Side, and the other at the West End ; the last of which is at present the most considerable of the two. They were both built in a manner perhaps peculiar to the *Romans* at that Time, and which it may not be improper to describe. They began first with a Layer of Bricks laid flat as in Pavements ; on that they placed a Layer of Clay and Marle mixed together, and of the same Thickness as the Bricks ; then a Layer of Bricks, afterwards of Clay and Marle, then of Bricks again, making in the whole three Layers of Bricks and two of Clay : Over this were placed Bricks and Lime 29 Inches, the Outside being faced with Bricks cut in Squares (like the modern Way of Building in some Parts of *Norfolk*), then Bricks and Clay again *Stratum super Stratum*, as high as the old Ruins now remain standing.

The Mortar is found extremely hard at this Day : It is a Composition of Lime, Sand, and Ashes, and so compact that I could by no Means break a Piece of it of an Inch Diameter from the Base of one of the Towers at the East Gate, but on striking it with a sharp Flint it flew off in Dust.

The *Roman* Bricks which I examined, were made of two different Sorts of Clay mixt ; when burnt one appears red and the other white : At the Time of my viewing them they were exceeding hard and solid, and far superior to any thing of the Kind now made with us. Perhaps they are little worse than when they were first laid down.

These Bricks were made without the Assistance or Addition of Sand, as is too much the Practice at
C c present

present here in *Norfolk* : For when Sand enters the Composition in any considerable Proportion, it renders the Bricks friable, soft, and rotten, subject to be broke or ground to Pieces with the least Motion or Pressure.

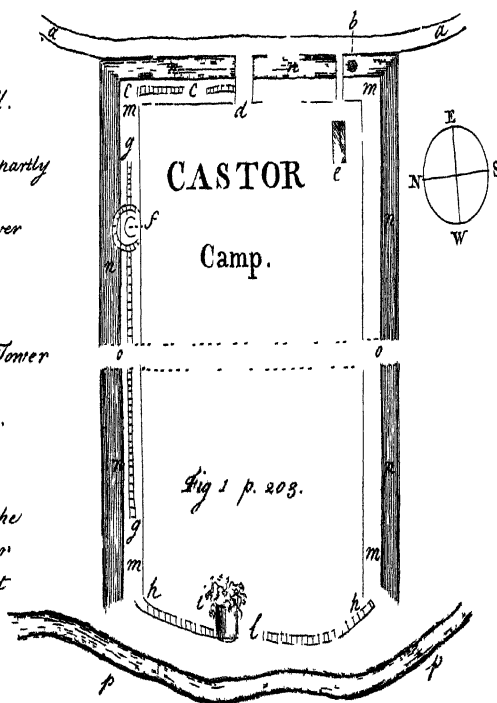
I took the exact Dimensions of several of these Bricks, and found their Length to be $17 \frac{4}{10}$ Inches, or a *Roman* Foot and Half ; and their Breadth $11 \frac{6}{10}$ Inches, or precisely a *Roman* Foot : which I think may serve as some Proof that the *Roman* Measures handed down to us by several Authors are right, and may likewise inform us of the proportionable Stature of Man at that Time. The Thickness of these Bricks is $1 \frac{3}{10}$ Inch.

The great Number of *Roman* Medals that have been, and are still found in and about this Camp, are to me a Matter of great Wonder. One Lady who lives near the Place, has (I am credibly informed) picked up at least an hundred with her own Hands, and several are daily gathered up by Boys, and sold to Strangers who come to visit the Place.

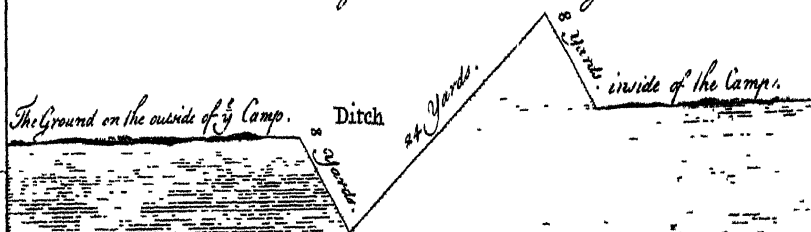
That these Pieces have been used as Money I think exceeding clear, from their different Degrees of Perfection, some being worn almost quite smooth, others having imperfect Busts without Letters, and others again having both the Busts and Inscriptions fair and legible, which could not happen, I think, but from their different Wear as Money. But then how such Quantities of them should become scattered, as if sown, in this and other *Roman* Stations, is a Difficulty I must leave to those better versed in these Matters to resolve.

Venta Icenorum.

- aa. The Road to Castor.
 b. A Spring Well.
 cc. The remains of a Wall.
 d. The Porta Prætoria.
 e. Castor Church built partly
 of Roman bricks.
 f. The Base of an old Tower
 lately discover'd
 gg. The Ruins of a Wall
 hh. The bottom of a Wall.
 i. The Ruins of an old Tower
 over grown with Ivy
 l. The Porta Decumana.
 mmm. The Rampart.
 nnn. The Ditch.
 oo. A Passage cut thro the
 Rampart but whether
 Original Gates or not
 is uncertain.
 pp. The River Wentsum
 or Wenifon.

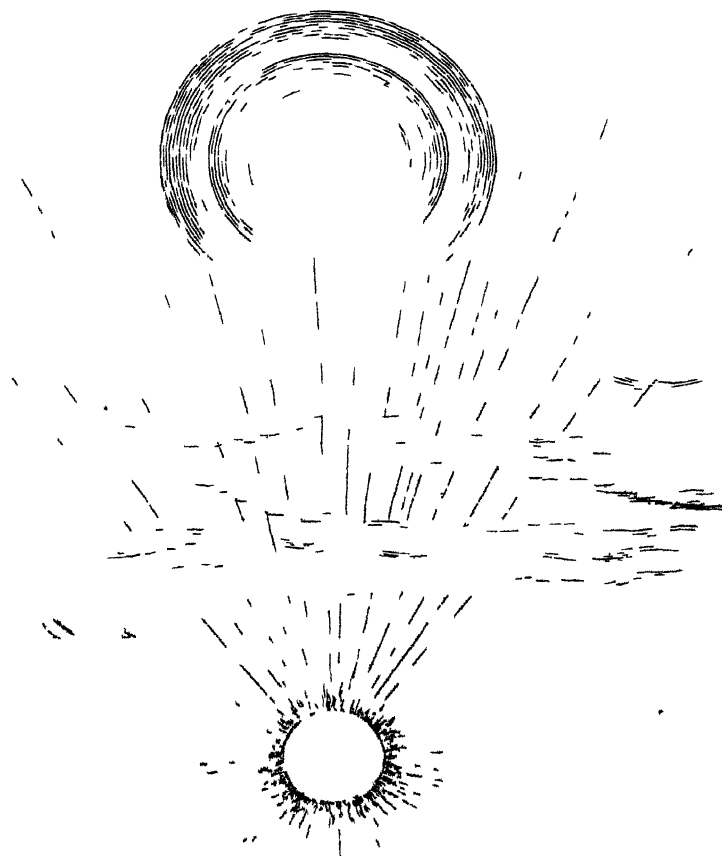


A Section of the Rampart and Ditch.
 as they are to be seen at this Day.



An Halo.

Fig. 2. p. 203.



J. Hyde. sc.

I send herewith a Plan of the Camp in its present Condition, [TAB. I. *Fig. 1.*] that my Description may the better be understood; and I send along with it the Appearance of a particular kind of Halo, which was observ'd at *Norwich*, on the 11th of *July* last, at 5 o'Clock in the Evening; the Colours were exceeding vivid, and the Centre of it, contrary to what I ever yet saw, was not in the Sun, but in the Zenith.

The Sun's Rays shone through the Clouds at the same time, as they frequently do when the Sun is near the Horizon. In short, the Drawing [TAB. I. *Fig. 2.*] which represents the Whole, makes any farther Description of it needless; and I shall only add, that I am,

Dear Sir,

Your most humble Servant,

Norwich, Aug. 28.
1749.

William Arderon.

III. *Part of a Letter from Leonard Euler, Prof. Math. at Berlin, and F. R. S. To the Rev. Mr. Caspar Wetstein, Chaplain to his Royal Highness the Prince of Wales, concerning the gradual Approach of the Earth to the Sun. Translated from the French, by S. T. M. D. F. R. S.*

Berlin, June 28. 1749.

Read Nov. 2.
1749.

Monsieur le Monnier writes to me, that there is, at *Leyden*, an *Arabic* Manuscript of *Ibn jounis* (if I am not mistaken

in the Name, for it is not distinctly wrote in the Letter), which contains a History of Astronomical Observations. *M. le Monnier* says, That he insisted strongly on publishing a good Translation of that Book. And as such a Work would contribute much to the Improvement of Astronomy, I shou'd be glad to see it publish'd. I am very impatient to see such a Work which contains Observations, that are not so old as those recorded by *Ptolemy*. For having carefully examined the modern Observations of the Sun with those of some Centuries past, although I have not gone farther back than the fifteenth Century, in which I have found *Walther's* Observations made at *Nuremberg*; yet I have observed that the Motion of the Sun (or of the Earth) is sensibly accelerated since that Time; so that the Years are shorter at present than formerly: The Reason of which is very natural; for if the Earth, in its Motion, suffers some little Resistance (which cannot be doubted, since the Space through which the Planets move, is necessarily full of some subtle Matter, were it no other than that of Light) the Effect of this Resistance will gradually bring the Planets nearer and nearer the Sun; and as their Orbits thereby become less, their periodical Times will also be diminish'd. Thus in Time the Earth ought to come within the Region of *Venus*, and in fine into that of *Mercury*, where it would necessarily be burnt. Hence it is manifest, that the System of the Planets cannot last for ever in its (present) State. It also incontestably follows, that this System must have had a Beginning: For whoever denies it, must grant me, that there was a Time, when the Earth was at the

Distance

Distance of *Saturn*, and even farther; and consequently that no living Creature could subsist there. Nay there must have been a Time, when the Planets were nearer to some fixt Stars than to the Sun; and in this Case they could never come into the Solar System. This then is a Proof, purely physical, that the World, in its present State, must have had a Beginning, and must have an End. In order to improve this Notion, and to find with Exactitude, how much the Years become shorter in each Century; I am in Hopes that a great Number of older Observations will afford me the necessary Succours.

I beg you will present my Respect to the Royal Society; and am,

Yours, &c.

L. Euler.

IV. *Part of a Letter from Mr. Benj Cooke, F. R. S. to Mr. Peter Collinson, F. R. S. concerning the Effects of the Mixture of the Farina of Apple-Trees; and of the Mayze or Indian Corn: And of a Child born with the Jaundice upon it, received from its Father; and of the Mother taking the same Distemper from her Husband, the next Time of being with Child.*

Read Nov. 2.
1749.

WHEN the Farina of one Apple impregnates another's Blossom of differing Species, we see the Change in * the Fruit; but whether any lasting Impression is left on the Bough

* See these Transactions No. 490. p. 622.

Bough which bore it (as seems to be in Tulips and some other Flowers), is not so easy to determine, Experiments of this sort being not to be made at all, but catch'd at distant Opportunities; and till this Point is settled, the Distemper of my good Friend's Tree must rest unexplained.

Artificial Helps of Sight have added to former Discoveries the explosive Manner of the *Farina's* Action; but what may be the Effect of the inconceivably fine subtil Matter emitted from its Globules, and continually wafted about in great Plenty and Variety in the Summer Air, not only on vegetable Productions (where on different Subjects it may not improbably have opposite Effects) but other Matters not yet suspected to be so much under its Influence, remains a Field of Inquiry for future Ages.—However, to what Mr. *Logan* hath very justly observed (*Transact.* 440.) on the Manner of Impregnation of the Seeds in Mayze—I can add this, that if the Seed and whole Species of Mayze be planted about two Yards Distance from each other, there will be a Mixture of red and white Grains in the Ears of each Plant, and you may with Pleasure observe the Filament in the white Plant, which hath been struck with the red Farina, discovering its alien Commerce by a conscious Blush, and by counting the Threads they stained, foretell how many corresponding Seeds will appear red, at the opening of the Ear, when ripe.

A MAN of about 22 Years married a healthy young Woman, much of the same Age.—Soon after he went to *America*, and at the End of seven Years returned cachectic, anasarous, and deeply tinged
with

with the Jaundice, endemical in hot Latitudes.— In a few Months after his Return his Wife became pregnant (with her first Child) of which she was delivered in due Time. The Child was born with a Jaundice upon it, and died about six Months after, under ascitical and icterical Symptoms, of which the Mother had not the least Impression.— Soon after this (and before the Husband, tho' much better, was quite cured) she became again with Child, and after about three Months Pregnancy turn'd yellow, and was the whole Time of her going with Child, and some Months after her Delivery, deeply affected with the Jaundice : But the Child was born quite fair, white, and healthy, without any thing of that Distemper on it ; and is still living, and the last born, —I make no Application—You must impute this Length of your Trouble to the wet Weather. I am most sincerely,

Dear Cousin,

Your most obliged

And most affectionate

B. Cooke.

V. *A Letter from the Rev. Henry Miles, D. D. and F. R. S. to Mr. Henry Baker, F. R. S. concerning a very cold Day, and another a very hot Day, in June and July 1749 and of the near Agreement of Thermometers in London and at Tooting.*

Read Nov. 16. 1749. **I** Now fulfil my Promise made to you some time ago, in sending you an Account of the two Days which were so remarkable, the one for Cold, the other for Heat, this last Summer.

On the 10th of *June*, suspecting a Frost that Night, I sat a *China* Saucer full of Water upon the Grass-plot, in the Garden; and the next Morning, a little before Sun-rising, I found the Water frozen over, of such a Consistence, as that I forced a Hole thro' the Centre of it with my Finger, without breaking it elsewhere, and carried the Cake of Ice into the House, where it remained a good While not dissolved. Wind was N. W. On some following Days there were several considerable Frosts, the Wind continuing the same way; the fatal Effects of which are sufficiently known throughout the Kingdom.

July 2d, at 12^h 20' my Thermometer of *Fahrenheit's* Scale, in the shaded Air, stood at 88—, and at 2^h *p. m.* at 87. At which last Number two others of the same sort stood exactly, at that Hour, in *London*.

Having agreed with my ingenious Friend Mr. *John Canton* of *Spital-Square*, to make Observations of the

the Temperature of the Air here, and in *London*, at a stated Hour : We procured Thermometers, made exactly alike, by that accurate Workman Mr. *Bird* ; and having found, by hanging them first together a sufficient Time, that they perfectly agreed, we began our Observations in *April*, and have continued them ever since.

The Thermometers are of the smaller Size, the Bulbs being but about $\frac{47}{100}$ of an Inch Diameter, and are immediately affected with any Mutations of the Air ; so that I have frequently been entertained with observing, in some Circumstances of the Weather, that the Mercury has not been stationary, but has successively risen and fallen for a good 'While ; and Mr. *Canton* has informed me, that he has several times observ'd the same.

I have annexed a Paper, containing an Extract from my Journal of the Weather, in which I have set down the Extremes of the Barometer and Thermometer, observed at 2^{*A*} *p. m.* for Six Months ; and Mr. *Canton* has been so kind as to communicate a like Extract from his Journal ; which is likewise put into your Hands.

It appears by a more general Comparison which we have made, as well as by this particular one, that the Difference in the Temperature of the Air, as to Heat and Cold, is very little between this Place and *Spital Square*. Sometimes my Thermometer has been higher than his ; more times upon an Equality, but most times lower—And I have Reason to think the Difference, many times, may have been owing to accidental Causes : For Mr. *Canton* has informed me, that he has found two Thermometers,

D d

when

when removed but a few Yards from each other, have differed 2 or 3 Deg. for which no apparent Cause could be assigned. So that upon the whole, it may reasonably enough be concluded, that the Difference between the Temperature of the Air in the two Places, is imperceptible to Sense. I am,

Dear Sir,

Tooting, Nov. 13. *Your, and the Royal Society's*
 1749. *Most obedient humble Servant*
 H. Miles.

P. S.

Upon my having observed that the Days, in which my Thermometer and Mr. *Canton's* stood at the Extremes, in some Months did not coincide, I was desirous of knowing, how much the Thermometers differed, when the Extremes did not happen on the same Day: But, upon a Comparison, the Difference was never considerable, except on the 4th *Aug.* at 2. *p. m.* when my Thermometer was about 6 Degrees higher than Mr. *Canton's*. This being somewhat remarkable, he, upon hearing it, had Recourse to his Register, and found, that at the Time of Observation a heavy Shower of Rain fell; whereas we had none here: But about Six in the Evening came on a Thunder Shower attended with Rain; so that it should seem the falling Rain had so great an Effect upon the Air as to render it cooler, by the Degrees mentioned: And perhaps the Difference between the two Instruments, at other Times, may have been owing to the same, or a similar Cause, rather than to a *stated* different Temperature of the Air, in the two Places.

EX.

EXTRACT from a Journal of the Weather, made at Tooling, in Surry, in which the Extremes of the Barometer and Thermometer are noted at 2^h p. m. equal Time, for the Months of May, June, July, August, September, and October, this present Year 1749.

MAY. 1749.			
DAY	BAR.	DAY	THER.
14	highest 30, 04	17	highest 76
DAY	BAR.	DAY	THER.
24	lowest 29, 15	3	lowest 50

JUNE. 1749.			
DAY	BAR.	DAY	THER.
8	highest 30, 10	28	highest 79
DAY	BAR.	DAY	THER.
17	lowest 29, 25	3	lowest 46

JULY. 1749.			
DAY	BAR.	DAY	THER.
8	highest 29, 95	2	highest 87 *
DAY	BAR.	DAY	THER.
20 22	lowest 29, 44	30	lowest 62½

AUGUST. 1749.			
DAY	BAR.	DAY	THER.
15	highest 30, 02	22	highest †
DAY	BAR.	DAY	THER.
2	lowest 29, 20	31	lowest 62½

SEPTEMBER. 1749.			
DAY	BAR.	DAY	THER.
26	highest 30, 37	5	highest 71
DAY	BAR.	DAY	THER.
17	lowest 29, 3	12	lowest 53

OCTOBER. 1749.			
DAY	BAR.	DAY	THER.
10	highest 30, 44	4 7	highest 61½
DAY	BAR.	DAY	THER.
28	lowest 29, 51	27	lowest 43

† Being absent Aug. 22d, at 2 p. m. I could not observe
D d 2

observe the State of the Thermometer; but am well satisfied that Day was the hottest in the Month, from the Observation I made at other Times of the Day, and particularly from the Account I had from my Friend Mr. *Canton*, of the State of his, which stood at $80\frac{1}{2}$ at 2. *p. m.*

It may be proper to observe, that the Barometer made use of stands $\frac{2}{10}$, or more, lower than others of the same Construction (which is the common upright Make) during the warmer Season of the Year, and usually as much higher than they do in the colder; but is made use of (as it has been for more than 10 Years) because I have always found it to rise and fall sooner than any other I have compared it with, and in particular than a very good one, made by the late Mr. *Siffon*, which has always hung by it, and is constantly compared therewith.

EXTRACT from a Journal of Observations on the Barometer and Thermometer, made in Spital Square, London, in which the Extremes of each are noted, at 2^d p. m. equal Time, for the Months of May, June, July, August, September, and October, this present Year 1749.

MAY. 1749.			
DAY	BAR.	DAY	THER.
13	highest 33, 23	13	highest 76½
DAY	BAR.	DAY	THER.
25	lowest 29, 33	4	lowest 59

JUNE. 1749.			
DAY	BAR.	DAY	THER.
27	highest 30, 32	28	highest 80
DAY	BAR.	DAY	THER.
17	lowest 29, 30	3	lowest 48½

JULY. 1749.			
DAY	BAR.	DAY	THER.
8	highest 30, 35	2	highest 87
DAY	BAR.	DAY	THER.
24	lowest 22, 66	18.30 31	lowest 64½

AUGUST 1749.			
DAY	BAR.	DAY	THER.
15	highest 30, 25	22	highest 80½
DAY	BAR.	DAY	THER.
2	lowest 29, 41	4	lowest 59½

SEPT. 1749.			
DAY	BAR.	DAY	THER.
26	highest 30, 44	5	highest 70½
DAY	BAR.	DAY	THER.
17	lowest 29, 37	2	lowest 54½

OCTOB. 1749.			
DAY	BAR.	DAY	THER.
10	highest 30, 49	7	highest 61
DAY	BAR.	DAY	THER.
28	lowest 29, 43	27	lowest 43

VI. *Account of a Bas-relief of Mithras found at York, explain'd by the Rev. Dr. Stukely, F. R. S. communicated to the Royal Society, by Mr. Francis Drake of York, Antiquary and F. R. S.*

York, October 25, 1749.

Read Nov. 23.
1749.

AS York was undoubtedly the Roman, Imperial City of Britain: So is it still, casually throwing up Remains of its antient Grandeur and Magnificence: Even down to our Time. About two Years ago, in digging the Foundation of a large House, since built, in our *Trans Tyberim Street*, called *Micklelegate*, *quasi Muckle*, or *Great Street*, the Workmen went much below any former Foundation that could be observed on this Spot. And at the Depth of ten Feet, came to a Stone, which upon taking up, appeared to have Figures upon it, but miserably defaced. Upon my viewing of it soon after, I confess, I was at a Loss what to make of it; but judged it some Representation of an Heathen Sacrifice, or Game, and therefore sent as just a Drawing of it, as could be taken, to my very learned Friend Dr. *Stukely*, who according to his deep Knowledge in the Learning of the Antients, soon after returned me the following short, but curious Explanation of this uncommon Piece of Sculpture.

“ The Drawing (see *Tab. II.*) you sent me, of the
 “ Bas-relief, dug up in a Cellar in *Micklelegate*, anno
 “ 1747. is a great Curiosity. 'Tis a Sculpture of *Mi-*
 “ *thras*; as usual, sacrificing a Bull. He has on, the
 “ *Persian* Mantle; called *Candys*, and the *Phrygian*
 “ Bonnet,



W. Stukely delin.

Inches 23 1/2.

J. Maydel sc.

‘ The other Figures are too imperfect, to trouble you with Conjectures about them ; but they all regard the same Design. They are officiating Priests, and drest in such a symbolic manner, as intimates the Sun’s Influence, and annual Motion.

‘ The *Mithriac* Ceremonics, as likewise the Mysteries of the Antients, were but the expiring Remains of the antient, patriarchal Religion ; and Worship of the true God : As it were, swallowed up by Paganism, and the Devil’s Inventions. For indeed the Patriarchal Religion was no other than Christianity antedated.

‘ For in the *Mithriac* Ceremonics, and Mysteries, they had plainly, the two Christian Sacraments : Initiation by Baptism : And the sublime Communion by Bread, and Wine. *Mithras* is but another Name of a *Messiah*, in his priestly Character : It signifies Mediator.

‘ Thus writes *Tertullian*, c. 40. speaking of the Devil perverting the Rites of true Religion : “ (He), the Devil persuades those that are initiated into the *Mithriac* Ceremonies, to believe an Expiation of their Sins by their being baptized : And they are crossed on the Forehead, as his faithful Soldiers. And likewise they there celebrate the breaking of Bread.” But they did not take these Ceremonies from the Christians ; they are of a much antienter Date ; perhaps from the Beginning of the World.

‘ The *Romans* became extremely fond of the *Mithriac* Sacreds, whence here you find this Sculpture in the Imperial City. I saw an Image of *Mithras* at *Chester*, and no Doubt there are many more in *Britain*, either destroy’d, or undiscover’d.

“ St.

“ St. *Jerom*, in his Epistle to *Læta*, writes, A
 “ few Years ago, your Cozen *Gracchus*, a Name of
 “ *Patrician* Quality, when he was Præfect of the
 “ City, destroy’d, broke, and burnt the Cave of *Mi-*
 “ *thras*.” This was at *Rome*, and about the Year
 378. Not long after, we may well imagine, your
Roman Præfect of *York* followed his Example, and
 demolished the subterranean Temple in *Micklegate*;
 where this Sculpture of him was found.

Stamford, July 30, 1747.

WM. STUKELEY.

VII. *Part of a Letter from James Mounsey,*
M. D. Physician to the Czarina's Army,
to Mr. Henry Baker, F. R. S. concerning
the Russia Castor, the Baths at Carlsbad,
the Salt-mines near Cracau, and various
other Notices.

Dear Sir,

Riga, July 1, 1749.

Read Nov. 23.
 1749.

I AM highly sensible of the Honour the
 Royal Society does me, in taking No-
 tice of what I communicated to you, and only wish
 I were as capable as I am zealous to contribute any
 thing that might be satisfactory and acceptable to
 that illustrious Body, for which I have the greatest
 Veneration.

I cannot as yet perfectly answer your Enquiries
 concerning the *Russia* Castor which is not all from
 the same Animal, some of it being the *Prostate*,
Testes, and Kidneys of the Beaver, gathered in the
 Spring; but the true Sort comes from quite a different

E c

. Creature,

Creature, which resembles a wild Goat, just by whose Navel the Castor is found like two Glands. This I am assured from People who have seen it on the Spot; but as they are quite unacquainted with natural History and Anatomy, we must not trust to them too much: I hope soon however to procure an Account that may be depended on. In the mean time, as you encourage me to write to you freely, I will inform you of what I judged the most remarkable in the Course of my last Journey.

The Kingdom of *Bohemia* is a fine fertile Country, rich in Metals and Minerals of all Sorts. The Frontiers all round are very high Mountains: The inward Parts of the Country are hilly, with Plains and rising Grounds intermixt, that have the Appearance of being the remaining Bases and Ruins of former Mountains; the Soil being a Composition of decayed Rocks mixed with some vegetable Earth. The Rocks on the highest Mountains are an aggregate Stone of *Lapides Calcarii, Spati, Quartzi, Mica, &c.* The Plains are covered with the least dissolvable Parts of such Rocks. Their finest Crystals, and precious Stones, are gathered behind the Plough; many still retaining the same Figures they had received at their Formation in the Veins and Hollows of the Rocks. I found on the Tops of Mountains decaying Rocks, which, when mixed with a little vegetable Earth, made exactly the same Soil with that in the rising Grounds and Plains below.

There are several Places in this Kingdom where the Mountains are wholly of *Lapis Scissilis*, which breaks into Rhomboids; and I observed for many Miles the Shelves of this Stone running through
different

different Mountains in the same Direction, facing the South-east, with an Inclination of the Shelves of about 35 Degrees. The Soil here in the Plains is clayey.

Not far from the Frontiers of *Saxony*, in the Mountains, are the famous hot Springs of *Carlsbad*, the Tin-mines of *Schlachtenwald*, and Mines of *Pyrites*, where they prepare Sulphur and Vitriol. As I send you Specimens of the Minerals I met with in these Places, I shall give you also the best Account I can of what belongs to their Production.

Of the hot Springs at Carlsbad.

CARLSBAD is a small Town, situated in an Hollow between two high Mountains: A small River called *Toeple* runs through it from S. E. to N. W. The principal Fountain rises on the North-east Side, about twenty Paces from the River, and about five or six Feet higher than the Surface of the Water. This Spring rises through a square Tube of Wood, whose Diameter is about seven Inches, with a considerable Degree of Violence: Whence it is called the *Sproudle*, or *Furious Fountain*. It comes from the Mountain on the other Side, and passes underneath the River, where the petrifying Quality of its own Water has formed for itself an Aqueduct of *Tophus*, through which it is conducted to this Place. Sometimes this Aqueduct is so filled and choaked up with the *Tophus*, that it bursts into the River, and puts the Inhabitants to a considerable Expence for repairing it. But to prevent this, they bore and clean it every Year near the Fountain: It

forms Rocks of *Tophus* along the Rive-slide, composed of *Strata* of several Colours, according as the Water has been impregnated with different Matter, or perhaps from the Difference of Heat or Cold, or the Impressions of the Air at the times of forming the *Lamellæ*. This *Tophus* is hard, and receives a good Polish, and of it they make Snuff boxes, Heads of Canes, and other Toys. Some Years ago, in digging to lay the Foundation of a Church, forty or fifty Paces higher up the Hill, they found vast Quantities of this *Tophus*, which was in many Places so decayed and rotten (resembling very soft Clay), that they were obliged to dig several Fathoms deep, before they could find a solid Foundation. Here they threw out great Quantities of the *Pisolithus*, of the Kinds I send you, which are composed of the same Matter as the *Tophus*, though of a very different Construction: The *Tophus* being made up of Plains joined together, whereas the *Pisolithi* are globular, and composed of several spherical Shells. Some Globules are found above an Inch in Diameter, but more commonly about the Bigness of white Peas, and decreasing gradually in Size till they become as small as fine Sand, and at last common *Tophus*.

The several Shells which compose these Globules differ in Colour as the *Lamellæ* of the other *Tophus* do: But these Shells separate more easily than the *Lamellæ*, and shew that the Colour often consists in one very thin Shell between two thicker ones.

Such kind of *Tophus*, with *Pisolithi*, is found at other Places; but I have never yet met with any body who could give a satisfactory Account of its Formation. Some think the *Pisolithi* are Drops of Water

Water petrified, as they are found commonly near Falls of Water which is impregnated with the like stony Matter : And as the smallest scattered Drops of Water fly farthest from the Centre, they so account for the gradual Diminution in Magnitude of the *Pisolithi*. Others affirm they grow from the Vapour of this petrific Water, though they cannot tell how.

Amidst this Uncertainty, I derermined, whilst I was on the Spot, to spare no Pains to search after (and discover, if possible) the manner how these regular globous Bodies are produced. I have already told you, that the Waters of these hot Springs at *Carlsbad* are so replete with tophaceous Matter, that where-ever they run, Masses of *Tophus* are formed ; and when these Waters are cold, a Scum (like the little Scales of the same Matter) rises on the Top, some of which I send you, and I believe you will think it, on Examination, little or nothing different from the Substance of the component Matter of the *Pisolithi*, or from that which forms the common *Tophus*, which I suppose to differ from the *Pisolithi* only in Appearance.

First of all, I observed in the Chinks and Hollows of the ordinary Rock-stone very small *Molecule* loosely adhering ; I found also Clusters of *Pisolithi* in the like Places, and on breaking up a Piece of the Rock by the Side of the River, where it had been burst by the Water, I discovered Masses of *Pisolithi* lying in the Chinks, and many loose ones twirling round and played about in the bubbling Water. My Supposition therefore is, that the Stream descending from the Body of the opposite Mountain, passing beneath the River, and afterwards bursting
out

out on the Side of the Hill with a considerable Force, could not fail to form Caverns in the Side of the Mountain, and to change its Current as the Passages became choaked up with the tophaceous Matter: And as I found vast Numbers of *Moleculæ* like Grains of Sand in the Chinks where Water passed, these being washed off might serve for *Nuclei* to the *Pisolithi*, and being kept in continual Motion by the *Vortex* or Whirling of the Water, would acquire a globular Figure, and by receiving new shelly Coats, from time to time, would increase in Bulk, so long as they were sustained, and whirled about in the Water. And as in this Case some would be precipitated sooner, and others later, a Difference in Size must consequently happen, and their Arrangement must be according to their Proportion of Surface and Gravity, till the Place becoming full of such Matter, the Water was obliged to seek out a new Passage. At the Formation of this Kind of *Tophus* in the Caverns, some intervening Accidents from the Motion of the Medium, the Influence of the Air, and other concurring Causes, have sometimes so far prevented a compact and firm Conjunction of the component Particles, that in several Places it seems in a decaying State; and is even soft as Clay. In the Air indeed it grows again somewhat harder, but then it is porous and light: And they call it *Sproudie Sand*. The Inhabitants of a House near the Church have a Hollow, out of which they take this, and sell it for the scouring and polishing of Silver, &c. In this Hollow it is very warm and suffocating, especially in rainy Weather, and then there rises from it a strong Vapour.

On the other Side of the River, at the Foot of the Mountain, are a good many Houses, and a broad Street ; cross under which the Stream runs, and in the Winter no Snow lies on the Place where it passes. Some Rooms in a House built here are always warm like a Bagnio, and in one of the Cellars may be heard the Noise of the Water running under Ground. Along this Side of the River are several hot Springs, which differ in Quality from one another, as well as from the Water of the *Sproudle*. The Principal of these is called the Mill-Fountain (from its being near a Mill) which is much used, and reckoned milder than the *Sproudle*. It is not near so saturated with the limy Matter, and forms scarce any *Tophus*.

These Springs either have different Origins, or else the great Stream divides in the Body of the Mountain into several Branches ; which, according to the Nature of the Passages they run through, or from the different Thickness of their Columns, and the Velocity they move in, are impregnated with different Matter, and when cold precipitate more or less Calx ; but their Salts are the same, nor is there much Difference in the Quantity they yield. The *Sproudle* is so full of the stony Matter, that any thing laid into it is covered over with a thick *Tophus* in a few Days. When the Water is taken up, and let stand a little in the Air, it incrusts the Vessels that contain it, and its Surface is covered with a Scale, like Lime-water, which is made Use of as a Dentifrice.

I don't propose to inform you of the medical Virtues of these Waters, nor to enter into physical Accounts of their Origin : I have only in view to satisfy you about the Formation of the Specimens I send you.

Most of the Rocks about *Carlsbad* are an Aggregate of *Spatum*, *Mica*, *Quartzum*, *Rubrica*, *cum Matrice Lapidis Calcarii*, and cleave into Rhomboids. The Soil on the Side of the Mountain is made by the Dissolution of such Rocks intermixed with some vegetable Earth; and the whole Surface is covered with the least dissolvable Parts, often adhering together in Masses by the Intervention of a limy Matter like incrusted *Spatum*. And I found higher up the Mountain some Rocks mounding into such Soil.

The *Carlsbad* Waters give a good deal of neutral Salt by boiling and crystallizing. From 1080 lb. of Water xxii Ounces of pure Salt. I send you some which I prepared myself, suspecting the Apothecary might adulterate it to increase the Quantity.

My Thermometer being broke, I procured one of a Friend: But not knowing of what Construction it was, I tried it in the following manner: In melting Ice the Mercury fell to $28\frac{1}{2}$ of its equal Parts, and by the Heat of my Body it rose to 66 of those Parts. This Thermometer held into the *Sproude* Fountain rose by its Head to 96, and in the Mill-Fountain to 67.

About twenty Miles from *Carlsbad* to the South-west near the Town of *Eyra*, is a cold Spring of Mineral Waters, much in Use in these Countries. This gives also a Salt much of the same Kind. To the South from *Carlsbad* about twenty five *English* Miles are likewise several cold Springs: One of which is much richer in this same Kind of Salt than the former. It belongs to the Monastery of *Toeple*. In the Winter, when they boil this Water, from x lb.
of

of Water they get sometimes above an Ounce of Salt. They prepare here a neutral Salt, by adding a mineral Acid, or perhaps some other neutral Salt (but the Preparation they keep a Secret) which makes it shoot into beautiful Crystals. It is called *Sal Medium Toeplitense*, and is sold in many Places of Germany. I send you Specimens of all these. On exposing these Salts some time to the Air, they fall into a *Magnesia*, but dissolving and crystallizing them again recovers them; tho' the oftener they are dissolved, the Crystals shoot the smaller.

About seven Miles South-west from *Carlsbad*, at *Altsettle*, are Mines of black *Schistus*, and formerly they made a great deal of Alum and Vitriol from it; but it is now neglected, as they find in the same Mines Plenty of *Gleba Pyriticosa*, from which they distil Sulphur. Six hundred Weight of this *Pyrites* give one of Sulphur: And the Oven makes from one to two hundred Weight per Week. The Residuum being thrown in great Heaps in the open Air, takes Fire, and constantly smokes. This Matter they throw into large Reservoirs of Water, which afterwards they let run off into the Boiling-House, and so make Copperas.

About nine *English* Miles to the South from *Carlsbad*, are the Tin mines of *Schlachtenwald*. They reckon this Mine has been wrought near 500 Years. There are five Entries, four whereof are provided with Machines for hoisting the Barrels with the Tin Stone: The fifth is for drawing the Water out of the Mine. The Number of Miners who work below Ground are 90: Each Man delivers 25 Barrels of this Stone per Week, and receives

something less than Half a Crown Wages. They have different Inventions in the Mine for splitting the Rock, but the most effectual one is bursting it with Gunpowder. The whole People employed in these Mines are about 300. The main Body of the Mine is nearly 700 Feet in Diameter, and from this go several East and West; for so the Mineral runs. The broadest of these Ways is about two Feet, and the Mineral in these Veins is richer than what is found in the main Body of the Work, whose greatest Depth is 650 Feet. The Tin-stone is first burnt in Kilns, which they say betters the Tin considerably, and makes it much more easy to stamp. After this Preparation it is brought to the Stamp-mills, where by stamping it becomes like grey River Sand, which they wash and separate the Tin from in the following Manner. They throw it by Shovels-full into Basons where there passes a Current of Water, and by keeping of it stirring it runs over by a broad Conduit descending by Steps, which are covered with coarse Linen Cloth; and by this Operation the Sand is washed away, and the Tin remains on the Cloth in Form of a black scaly Powder, and dried is fit for Melting. One hundred Weight of the Stone gives ~~only three Ounces~~ of Tin; and 150 lb. of the clean-washed Tin-mineral give 140 lb. of Tin. There are ten Melting Ovens, each whereof can melt nine or ten hundred Weight in twenty-four Hours; the Breadth of these Ovens within-side is eight or nine Inches, and from ten to twelve Feet long, blown by two Pair of Bellows. The Proportion of Charcoal to the Metal is near an equal Weight. They are thrown into the Oven by Degrees, alternately :
The

The Residuum they melt three times over, which always yields new Metal. They make here about 800 Centers *per Annum*, which is sold from fifty-three to fifty-six Imperial Gouldens *per Center*. They find sometimes the black and sometimes the white crystal Mineral in Nests, or Clusters: The *Stannum Poledron Nigrum* is a very pure and rich Tin Ore: They say the white is rich also, but 'tis so hard and difficult to melt, that the Tin is burnt to an Ash before it can be brought to Fusion.

Near *Geffries*, in *Bareith*, they boil Vitriol. The Mineral from which they make it, is a black *Schistus*, some of it too is brown. It has several small Veins of Pyrites in it. When first taken out of the Pits it has no Taste, but after it has been exposed some Time to the Weather, and begins to moulder, it acquires a very sharpe Taste. It is laid in great Heaps, under which there are Cisterns for receiving the Water that runs from it after Rain, or that they pump upon it when the Weather is dry. This Water is conveyed by Conduits into the Boiling-House, where there are two Leaden Kettles, in which it is boiled to a strong Ley, and then let off into Receivers where it shoots. These two Kettles make from eight to nine hundred Weight *per Week*, which is all wrought by two Servants: It not having been found necessary to add any new Mineral to the Heaps these fifteen Years past, as they assured me. But as the Quantity of the Mineral consumed in that Time is not known, it is impossible to determine how much of this Salt has been supplied by the Air. They only add to the Quantity half an hundred Weight of Iron, which is consumed in the Kettles

every Week, and makes it shoot into Copperas ; but in Place of this, if they add Copper, it makes blue Vitriol. Formerly they made Alum here likewise from the same Ley, only instead of Iron or Copper they added Pot-Ash and Urine : But the Expence of the first, and the Difficulty of getting the other in sufficient Quantity, has made them leave off making Alum here for some Years past.

Of the Salt-mines near CRACAU. .

NEAR *Cracau* in *Poland* are famous Salt-Mines, of which I shall give you a short Account, as well as of the most remarkable Things I found there. The Town is situated near the Foot of a vast Chain of Mountains, and from it, passing by Hills and rising Grounds about two *German* Miles Southward, I came to the Mines of *Vilitzca*. These are in a Hill flat and irregular above, surrounded with Hollows and Vallies, and to the South there is a neighbouring Hill much higher. The Mine has ten Entries, which are provided with Horse-Engines, whereof seven are for hoisting up the Salt, and the rest for drawing Water from the Works, and for the Descent, and Ascent of the People. I entered the Mine by winding Stairs of 484 Steps, which brought me to the first Story. The Descent into the second is by strait Stairs of 133 Steps. Into the lowermost Story there are no Stairs, but eighteen Ladders from different Floors, which make together 300 Feet ; and the computed Depth of the Whole is about 900 Feet perpendicular.

The several Strata of the Earth are as follow.—
On the Surface is a common clayey Ground, next is
pure

pure Clay, and then a Bed of soft, moist, black, slimy Earth; and below this are Hills of a Kind of Earth without any Mixture of Grit or Sand. Here are first found Particles and Veins of Salt; and, descending a good Way through this and some Salt Rocks, we enter into the first Story, where there are a great many Alleys and Cross-ways (which are run out to considerable Distances), and many large Caverns, out of which Salt has been cut. Here the Floor, Walls, and Cielings, are solid Salt Rock. As the Religion of the Country is *Roman* Catholic, there are several large Chapels, with Altars adorned with Columns, Crucifixes, Statues of Saints, and other Ornaments in that Way, hewed out of the Salt Rock, and well wrought in different Orders of Architecture. Some of these, which are of the purer Salt, and not much smoked with the Torches that the Workmen use in the Mine, have a very beautiful Effect. In some Places the Sides of the Alleys, and some of the great Vaults, are lined and doubled with Timbers, where they thought the Pillars of Earth or Salt left for supporting the superior Weight might prove too weak. I observed in one Place, that a Sinking of the Earth some Years ago had crushed some of the Baulks almost flat, and made a Rent in the Salt Rock on the other Side, about nine Inches wide.

Notwithstanding there is no Remembrance or Tradition of any remarkable Accident by the Falling-in of these Mines, yet they have lately discovered a Wooden House, which must have been swallowed in very long ago. These Mines were on Fire in the Year 1644. but this Accident must have happened long before that time; for they have a Plan of these Works, taken about 200 Years ago, with Remarks

of every thing that was curious in all three Contignations ; but no mention is made of this House, nor is there any-thing in the Registers of these Works that shews it to have sunk in since. The Wall of this House is seen at the Side of one of the Cross-ways : They have found Plates, Spoons, and some other Things of Metal ; but they make no farther Search, as the Pains would exceed the Profit : So it is left as a Curiosity.

Notwithstanding the Salt Rocks are on all Sides, and the Earth that is among them is full of Veins and Particles of Salt, there is a Spring of very good fresh Water, which is the Drink of the thirsty Workmen, and of the Horses employed below-ground. This Source comes from above ; but directly over that Place, on the Surface, there is no Well, nor springy Ground, only it is hollow.

They find in these Mines Alabaſter, *Glacies Mariæ*, *Gypsum*, and sometimes *Pectines*, or small Sea shells : But the most remarkable Thing of all is, in the Middle of a vast Salt Rock, a large Tree is found, with all its Branches incased in it, lying horizontally. I send you a Piece of it, which I hewed out of the Rock myself. It seems to be a Beech-tree, of which there grow Plenty in these Countries at present.

From the upper Story the Rocks grow broader like Cones, and the deeper they go, the Salt is always finer, and less mixed with Earth : But it is not yet known how deep they run. They do not however find it turns so much to Account to work the lowermost Story, though it is all pure Rock, the Hoisting being more expensive than the running out Cross-ways, and working the upper Stories. The
Rocks

Rocks have Roots or Veins, which shoot into the Earth on all Sides, some in straight Lines, others in Zigzag, even to the Distance of Seventy Feet; whereby the Miners are often directed to the Body of the Rock. These Veins are very white and clear, yet they make no Use of what is found in them, being impure, and mixt with other Salts: It likewise dissolves much easier than the true Salt. *Sal Gemma* is found in Veins and Nests in several Places of the Mines, but 'tis often very troublesome to hew, and get it out of the other Salt Rock. Here are no Wells of *Naphta*, but there are some Cavities where the Air is so inflammable, that some, by going rashly into such Places with a Light, have been damaged by the Fire, and even run the Risque of their Lives. This only happens in Places where the Air has no free Admission; for in all the main Streets and cross Ways there is a considerable Draught of Air thro' the Ten Entries: And, in the Winter, while it is a strong Frost, and quite calm Weather, there reigns a very strong Wind in the Mines: But stormy Weather makes no Alteration; and in the Summer there never happen any such Changes.

From the several Ways are Entries into the Chambers or Vaults where they work. They hew the Sides of the Wall into large square Columns, the Height of the Room, and about Two or Three Feet thick. By driving their Wedges in behind these Pillars, they make them rend from the Rock, and their Fall on the Floor makes a very great Noise. The Workmen are so accustomed, that by the Sound of their Blows they know the Instant it is going to fall, and get out of the Way accordingly. Sometimes they

they hew the like Pieces from the Floors.—These Pillars are again hewed into Blocks, from Three to Six Feet long, according to their Thickness. They are drawn up, and transported in such Pieces, and the small in Barrels.

The Quantity of Salt dug here yearly, comes to about 120,000 Centeners of *Vienna*: and the whole Expences for Officers, Workmen, Materials, &c. amount to about 100,000 Dollars. The Number of Workmen of all Sorts make about 600 Persons: They are very healthy and long-lived, not subject to the Scurvy, or any particular Distempers. The Officers on the contrary are very subject to Diseases of the Breast, and Consumptions, which is probably owing to the frequent Changes of Air they meet with, their Business obliging them to stir about much, both above and below Ground, where the Air is very different.

These, Sir, were the most material Observations I was able to make in the Progress of our long March, amidst my daily Cares and Fatigues in the Duties of my Profession. I shall from time to time give you Accounts of whatever I think remarkable, and if you, or any Gentleman of the Royal Society shall favour me with any Inquiries concerning the Productions of this Country, I will return the most satisfactory Answer in my Power. I hope to hear of your receiving this, and am,

Sir,

Your most humble Servant,

JAMES MOUNSEY.

VIII. *The Case of a Lady, who was delivered of a Child, which had the Small Pox appeared in a Day or two after its Birth; drawn up by Cromwell Mortimer, M. D. Secr. R. S.*

THIS Gentlewoman had never had the Small Pox that she knew of, and was accounted by her Relations likewise not to have ever undergone that Distemper. In *Feb.* 1700-1. she was big with Child, and within about a Fortnight or three Weeks of her full Reckoning, when the following Accident happened. A poor Widow Woman, who lived in a lonely Cottage in the Neighbourhood, was seized with the Small Pox, and had nobody to assist or nurse her; the Country People, as much afraid of this Distemper as of the Plague, would neither send her Necessaries, nor suffer her to come to their Shops to buy: Wherefore in this Extremity she made shift to get to this Lady's House, who was noted for her Goodness to the Poor, especially for giving them Medicines when sick: Her Business was to entreat the Lady to desire her Husband to use his Authority with the Overseers of the Poor to appoint a proper Nurse to attend her; for that otherwise she must certainly perish for want of Necessaries; for even the Parish-Officers would not go near her. She expressed a very earnest Desire to speak to the Lady herself, who consented to go to a Window, and spoke to her cross a Court-yard at 30 or 40 Feet Distance, thinking herself safe from Infection in that Situation.

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She look'd upon her without any Surprize, but thought the Sight very disagreeable, the Woman having her Face and Arms full of a large distinct Sort, in the State of Maturation. About a Fortnight after, *viz.* Feb. 25. 1700-1. the Lady was brought to bed of a fine jolly Boy: In a Day or two there appeared an Eruption all over his Skin, which was at first taken by the Nurse for the Red-Gum, tho' the Appearance was earlier than that Disorder usually attacks Children; but in a Day or two more it shewed itself to be the confluent Small Pox. The Child was immediately removed from its Mother; but the Distemper proved to be of the very worst Sort, so that the Child died before the Turn: The Mother took no Infection, and lived to the Year 1736. without ever having the Small Pox.

It is very surprising and wonderful to consider the different Manners, in which Children, while in their Mothers Wombs, are affected by various Accidents happening to the Mothers. How the Imagination only, affected by the Disagreeableness of the Sight, should convey the Infection to this Child in the Case above recited, is, I own, what I am not able to account for; especially as there was no Fright or Surprise, and that the Mother was under no Apprehension of Danger.

The above Account is what I lately took down in Writing from a Daughter of the Gentlewoman. Indeed many Years ago I have heard the Lady herself mention the Accident; but I did not commit it to Writing; but I think it was with this Difference that she was surprised, and that the Child was born with the Small Pox upon it, in the eruptive State,

IX. *Some Accounts of the Foetus in utero
being differently affected by the Small Pox.*
By W. Watson, F. R. S.

Read Dec. 7. 1749. **T**HAT the human Species should

only once in their Lives be liable to the Small Pox, has long been observed with Surprise, both by Physicians and Philosophers: Nor is it less extraordinary, that the Child before Birth, which in every Circumstance is equally supported by its receiving and circulating its Mother's Fluids, should be so differently affected by that Distemper.

From the Dissections of those who have died of the Small Pox, we find that the *Viscera* are subject to the variolous Abscesses as well as the Skin; but that the *Fœtus* does not always partake of the Infection from its Mother, or the Mother from the *Fœtus*, is the Subject of this Paper.

About four Years since I attended a young Man, a Servant to a Carpenter, who had a very putrid and offensive kind of Small Pox; of which nevertheless he recovered. His Mistress, during his Illness, came frequently into his Room, and sometimes continued there a considerable Time. She was then about seven Months gone with Child, but had had the Small Pox herself many Years before. At the usual Time she was delivered of a Girl, whom I saw very soon after its Birth: and there appeared very plainly the Marks of about forty Pustules, in different Parts of her Body. From this Appearance I then inform'd the Parents, that I apprehended the Child

would hereafter be very secure from the Infection : But as about a Month ago the Parents thought proper to have a little Boy of theirs inoculated, I requested that they would permit the before-mentioned Girl to be inoculated likewise. As I desired, they were both inoculated, from a Child of my own, who had, from Inoculation, had a favourable Kind. Upon the tenth Day after the Operation the Boy sickened, and had the Small Pox, very favourably: About the same Time the Girl grew pale, and lost her Appetite. This Indisposition continued for two or three Days, and then she recovered.

In both these Children, the Incisions, which were made only in one of their Arms, were extremely superficial, and inflamed in both as usual: That in the Boy produced the variolous Fever and its Attendants, as is before-mentioned; but in the Girl occasioned only a Paleness and Loss of Appetite without a Fever, and one variolous Abscess in one Part of the Incision, such as is sometimes seen in Nurses, and in those who have attended Persons in the Small Pox, who have had it themselves before. This one Pustule was a sufficient Argument of the variolous Matter taking Place, and endeavouring to excite the usual Symptoms.

Dr. *Mead* in his learned Treatise concerning the Small Pox takes Notice of a Woman's attending her Husband, who, a short Time before she expected her Delivery, was ill of the Small Pox. As she had undergone the Distemper herself a considerable Time before, she felt no Inconvenience therefrom; but upon her Delivery the Child was found dead, and its Body covered with the Small Pox.

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These two Histories evince, that the Child before Birth, though closely defended from the external Air, and enveloped by Fluids and Membranes of its own, is not secure from the variolous Infection, though its Mother has had the Distemper before. They demonstrate the very great Subtility of the variolous Effluvia; as we find them capable either from their floating in the Air, and by their being taken in by the Inspiration of the Mother, or by penetrating the absorbent Vessels upon her Skin, and thus mixing with her Blood, of exerting their Effects upon the Child: And we may observe further from the first of these Cases, that it is possible for the Child to live through the Small Pox before its Birth; as well as that after that Period under the before-mentioned Circumstances it is not liable to the Infection again.

The following History is equally remarkable with the preceding.

A Lady of high Birth and Quality now living, well known to several Members of this learned Body, had the Small Pox to a great Degree when seven Months gone with Child; notwithstanding which she went her Time and was delivered of a Son, who did not appear to have upon his Body any Marks of the Distemper. As this Lady had been severely handled by the Small Pox, it was judged that her Child would never after be liable thereto; nevertheless when about four or five Years old, he was attacked with the Distemper, but got very well through it, and is now alive.

A Case in some respects resembling this last is taken Notice of by *Mauriceau**, who delivered a Woman
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* See *Mauriceau sur les maladies des femmes grosses*, Case 576.

of an healthy Child at her full Time, who during the fifth Month of her Gestation had had the Small Pox to a great Degree; although the Child, from any Marks of its Body, did not appear to have been affected with the Distemper.

These Cases are the very Reverse of the former; where though from Inoculation the most minute Portion of Lint, moistened with the variolous Matter and applied to the slightly wounded Skin, is generally sufficient to propagate this Distemper; yet here we see that the whole Mass of the Mother's Blood, circulating during the Distemper through the Child, was not sufficient to produce it.

It generally happens, as we are informed by medical Writers, and as I myself have seen in Practice, that if Women are delivered during the Course of the Small Pox, the Distemper of the Child does not keep Pace with that of its Mother, but is subsequent thereto. Thus the Child of the Lady, mention'd by the learned Dr. *Mead**, who was brought to bed on the eleventh Day, when labouring under a very malignant Small Pox, was born without any Appearance of the Pustules; but on the fourth Day after its Birth the Child was seized with Convulsions, and died at the Eruption of the Small Pox. And in a Woman, whom I attended, and who was delivered of an apparently healthy Child upon the ninth Day of a distinct Small Pox, the Child was not seized until the eighth Day after its Birth, which is about the Time that the Infection would have taken Place, if it had been received from any other Quarter, independent of its Mother's having the Distemper before its Birth.

From

* Vide *Tract. de Variolis*, pag. 66.

From these Histories it appears, that the Child before its Birth ought to be consider'd as a separate, as a distinct Organisation ; and that, though wholly nourish'd by its Mother's Fluids, with regard to the Small Pox, it is liable to be affected in a very different Manner, and at a very different Time, from its Mother.

X. *The Case of Nicolas Reeks, who was born with his Feet turned inwards, which came to rights after being some time used to sit cross-legged. Transmitted from Wm. Milner, Esq; at Poole, to Sir Peter Thompson, Knt. F. R. S.*

Read Dec. 7. 1749. *N*icolas Reeks was born in the Town of Poole, 1724. with both his Feet turn'd inwards. His Mother carried him to a Surgeon, who upon Examination gave it as his Opinion that he was incurable. The Boy, as he grew up, was with great Difficulty able to walk, but always on the outward Edge of his Feet and Heels, so that he frequently fell down in walking, one Foot striking against the other.

His Parents being poor, in 1735. the Parish put him Apprentice to Mr. *Richard Mocket*, of the same Town, Taylor, apprehending it the only Trade he could be fit for as a Cripple. His Shoes were made in a peculiar manner to lace on to his Legs, the
Muscles

Muscles of which were much smaller than those of Boys of his Age. He lived with his Master, and worked at the Trade, till about 1741. when they began to perceive a manifest Alteration and Turn in both of his Feet; which was brought on without the Assistance of any manner of Art, Application of Plaisters, Oils, or Bandages, till both Feet were turned to their right and natural Situation. He was able to wear his Master's Shoes, the Muscles of his Legs grew larger, his Feet and Legs like other Peoples of his Age; if any Difference, they turned outwards more than others do. In *March 1743*. he ran away from his Master, entered on board a Ship of War as a Marine, and is now living at *Portsmouth*.

Nov. 1. 1749.

‘ I *Richard Mockett*, having read over the foregoing Case, do hereby certify, that *Nicolas Reeks* was a Cripple, as therein described, when I took him an Apprentice; and that he was cured, whilst he lived with me, without any Advice, Assistance, or Application of Medicine, or Bandage whatever: And I am of Opinion the Cure was performed by his sitting cross-legg'd on the Shop-board; as witness my Hand, in *Poole*, 1st *Nov. 1749*.

‘ *Rich^d. Mockett.*’

‘ We whose Names are hereunto subscribed, do well remember, that *Nicolas Reeks*, mentioned in the foregoing Certificate, and formerly apprenticed to Mr. *Richard Mockett*, was born hurl-footed in both Feet, and a Cripple; and do know, that he
‘ was

‘ was cured, and well able to walk, before he left
 ‘ his said Master ; and do believe it was performed
 ‘ without any Art or Assistance whatever, than as
 ‘ exprefs’d above ; as witness our Hands,

‘ *Mabella Glover.*

‘ *Eliz. Glover.*

‘ *Susannah Jasper, the*
 ‘ Boy’s own Aunt.’

The foregoing Account of the Cripple *Nicolas Reeks* was drawn up in such Terms as were most agreeable to the Apprehensions of the Persons who have certified the Truth of the Fact, and to whom it was first read : And I am well satisfied in the Credibility of their Testimony, and that many other Persons of Reputation might be called on, who would sign the same.

Customhouse, Poole,
Nov. 11, 1749.

W. MILNER.

XI. *A Letter from Mr. James Short, F.R.S. to the President, with the Description and Uses of an Equatorial Telescope.*

S I R,

Read, Dec. 7.
 1749.

I Send you along with this the Description and Uses of the Equatorial Telescope, as also a Drawing of it ; which you desired of me some time since, in order that it might be laid before the Society. I have made three of these Instruments, one of which was bought by Count *Bentink*

H h

for

for the Prince of *Orange*; the other two I have still by me, one of which I shall shew to the Society. I do not pretend to any-thing new in the Combination of these Circles, of which this Instrument consists, the same Combination having several times been made before me, by way of a Dial: But I believe the putting so large a Telescope upon this Machinery, and applying it to the Uses which I have done, is some what new. I am,

S I R,

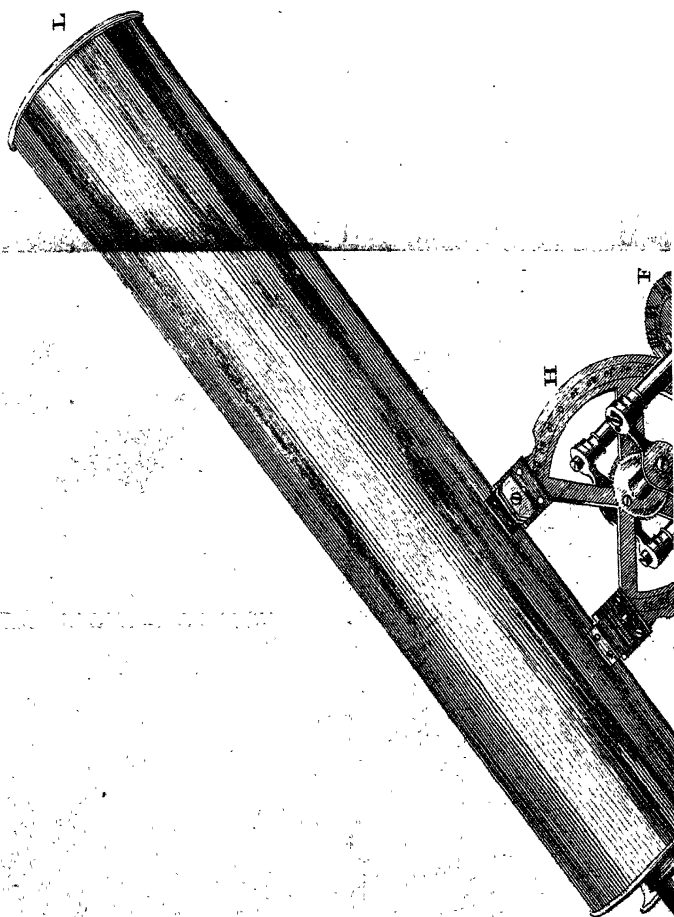
Surry-street, 7th Dec. 1749. Your most obedient humble Servant,

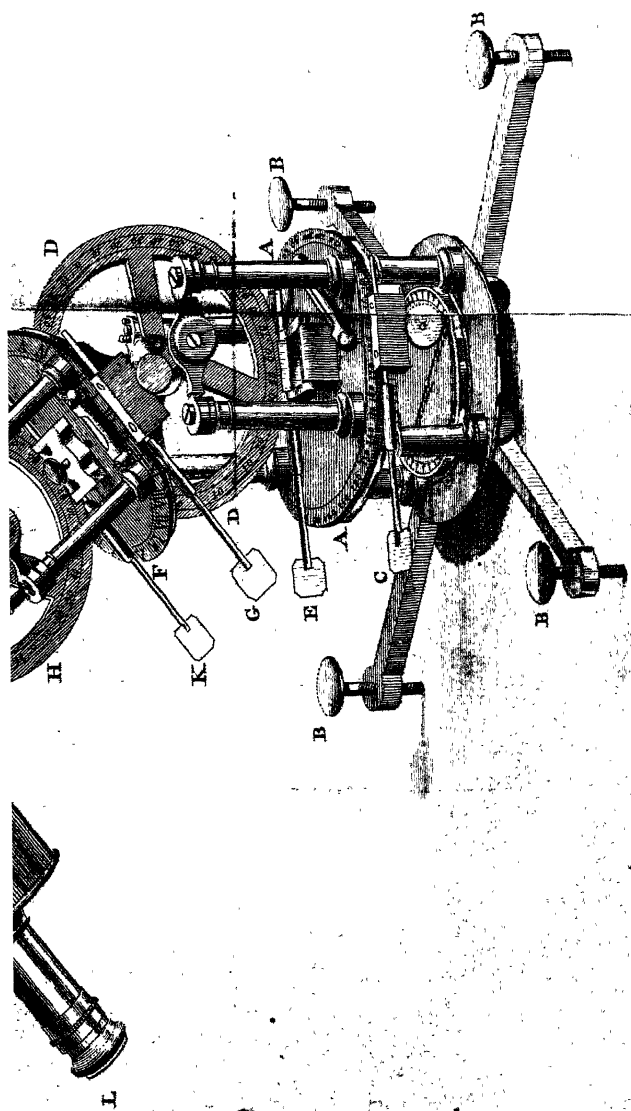
J A. SHORT.

*Description and Uses of the Equatorial Telescope,
or Portable Observatory.*

THIS Instrument consists of two circular Planes or Plates, mark'd *AA* in the annexed Drawing, *Tab. III.* which are supported upon four Pillars; and these are again supported upon a Cross-foot, or Pedestal moveable at each End by the four Screws *BBBB*: The two circular Plates *AA* are moveable, the one above the other, and are called the horizontal Plates, as representing the Horizon of the Place; and upon the upper one are placed two Spirit-Levels, to render them at all times horizontal: These Levels are fixed at Right-Angles to one another: This upper Plate is moved by a Handle *C*, which is called the Horizontal Handle, and is divided into 360° ; and has a *Nonius* Index divided into every three Minutes,

Above this horizontal Plate there is a Semicircle *DD*, divided into twice 90° ; which is called the Meridian Semicircle, as representing the Meridian of the Place,





Equatorial Telescope

J. Mynde sculp.

Place, and is moved by a Handle *E*, which is called the Meridian Handle, and has a *Nonius* Index divided into every three Minutes.

Above this Meridian Semicircle is fasten'd a circular Plate, upon which are affixed two other circular Plates *FF*, moveable the one upon the other, and are called the Equatorial Plates; one of them, representing the Plane of the Equator, is divided into twice 12 Hours, and these are subdivided into every 10 Minutes of Time. This Plate is moved by a Handle *G*, called the Equatorial Handle, and has a *Nonius* Index for shewing every Minute.

Above this Equatorial Plate there is a Semicircle *HH*, which is called the Declination-Semicircle, as representing the Half of a Circle of Declination, or horary Circle, and is divided into twice 90°, being moved by the Handle *K*, which is called the Declination-Handle. It has also a *Nonius* Index for subdividing into every three Minutes.

Above this Declination-Semicircle is fastened a Reflecting Telescope *LL*, of the *Gregorian* Construction, the focal Length of its great Speculum being 18 Inches.

In order to adjust the Instrument for Observation, the first thing to be done, is to make the Horizontal Plates level or horizontal, by means of the two Spirit-Levels, and the four Screws in the Cross-Pedestal. This being done, you move the Meridian Semicircle, by means of the Meridian Handle, so as to raise the Equatorial Plates to the Elevation of the Equator of the Place; which is equal to the Complement of the Latitude (and which, if not known, may likewise be found by this Instrument, as shall be afterwards shewn).

shewn). And thus the Instrument is ready for Observation.

To find the Hour of the Day, and Meridian of the Place.

First find, from astronomical Tables, the Sun's Declination for the Day, and for that particular Time of the Day; then set the Declination-Semicircle to the Declination of the Sun, taking particular Notice whether it is North or South, and set the Declination-Semicircle accordingly.

You then turn about the Horizontal Handle, and the Equatorial Handle, both at the same time, till you find the Sun precisely concentric with the Field of the Telescope. If you have a Clock or Watch at hand, mark that Instant of Time; and by looking upon the Equatorial Plate, and *Nonius* Index, you will find the Hour and Minute of the Day, which comparing with the Time shewn by the Clock or Watch, shews how much either of them differ from the Sun. In this manner you find the Hour of the Day.

Now, in order to find the Meridian of the Place, and consequently to have a Mark, by which you may always know your Meridian again, you first move the Equatorial Plate, by means of the Equatorial Handle, till the Meridian of the Plate, or Hour-line of 12. is in the Middle of the *Nonius* Index; and then, by turning about the Declination-Handle till the Telescope comes down to the Horizon, you observe the Place or Point which is then in the Middle of the Field of the Telescope; and a supposed Line drawn from the Center of this Field to that Point in
the

the Horizon, is your Meridian Line. The best time of the Day for making this Observation for finding your Meridian, is about three Hours before Noon, or as much after Noon. The Meridian of the Place may be found by this Method so exact, that it will not differ at any time from the true Meridian above 10'' of Time; and if a proper Allowance be made for the Refraction at the time of Observation, it may be found much more exact. This Line thus found will be of Use to save Trouble afterwards; and is, indeed, the Foundation of all astronomical Observations.

To find a Star or Planet in the Day-time, even at Noon-day.

The Instrument remaining as rectified in the last Experiment, you set the Declination-Semicircle to the Declination of the Star or Planet you want to see; and then you set the Equatorial Plate to the Right Ascension of the Star or Planet at that time, and, looking thro' the Telescope, you will see the Star or Planet; and after you have once got it into the Field, you cannot lose it: For, as the diurnal Motion of a Star is parallel to the Equator, by your moving the Equatorial Handle so as to follow it, you will at any time, while it is above the Horizon, recover it, if it be gone out of the Field.

The easiest Method for seeing a Star or Planet in the Day-time is this: Your Instrument being adjusted as before-directed, you bring the Telescope down so as to look directly at your Meridian Mark; and then you set it to the Declination, and Right Ascension, as before-mentioned.

By this Instrument most of the Stars of the first and second Magnitude have been seen even at Mid-day,

day, and the Sun shining bright; as also *Mercury*, *Venus*, and *Jupiter*: *Saturn* and *Mars* are not so easy to be seen, upon account of the Faintness of their Light, except when the Sun is but a few Hours above the Horizon.

And in the same manner in the Night-time, when you can see a Star, Planet, or any new Phænomenon, such as a Comet, you may find its Declination and Right Ascension immediately, by turning about the Equatorial Handle, and Declination-Handle, till you see the Star, Planet, or Phænomenon; and then, looking upon the Equatorial Plate, you find its Right Ascension in time; and you find, upon the Declination-Semicircle, its Declination in Degrees and Minutes.

In order to have the other Uses of this Instrument, you must make the Equatorial Plates become parallel to the Horizontal Plates; and then this Instrument becomes an *Equal Altitude Instrument*, a *Transit Instrument*, a *Theodolite*, a *Quadrant*, an *Azimuth Instrument*, and a *Level*. The manner of applying it to these different Purposes is too obvious to need any Explanation.

As there is also a Box with a magnetic Needle fastened in the lower Plate of this Instrument, by it you may adjust the Instrument nearly in the Meridian; and by it likewise you may find the Variation of the Needle: If you set the Horizontal Meridian, and the Equatorial Meridian, in the Middle of their *Nonius* Indexes, and direct your Telescope to your Meridian Mark, you observe how many Degrees from the Meridian of the Box the Needle points at; and this Distance or Difference is the Variation of the Needle.

XII. *An Eclipse of the Moon, observed at Mr. Graham's in Fleet-street, by John Bevis, M.D. and Mr. James Short, F.R.S.*

[Read Dec. 14. 1749.]

	By the Clock.	App. Time.	
1749.			
Dec 11.	23 56 15½	h ' "	The Sun pass'd the Meridian.
12.	6 43 0	6 46 36	A sensible <i>Penumbra</i> .
	6 47 20	6 50 56	Eclipse begins.
	7 1 26	7 5 1	Shadow touches <i>Tycho</i> .
	7 3 12	7 6 47	<i>Tycho</i> half covered.
	7 4 38	7 8 13	<i>Tycho</i> covered.
	8 33 37	8 37 11	<i>Tycho</i> begins to be uncovered.
	8 34 50	8 38 24	<i>Tycho</i> half uncovered.
	8 36 9	8 39 43	<i>Tycho</i> quite uncovered.
	9 9 5	9 12 38	Eclipse ends.
	9 13 30	9 17 3	<i>Penumbra</i> gone.
	12 5 53½		Moon's Center pass'd the Meridian.
	12 20 2		<i>Sirius</i> pass'd, his Mean Right Ascension being 98° 31' 38".
13.	23 56 46		The Sun pass'd the Meridian.

The Appulses of the Shadow to the Spot *Tycho* were observed with a Reflecting Telescope, which magnified about 40 times, and may be serviceable for geographical Purposes. The Beginning and End of the Eclipse were estimated by the bare Eye, and a Refracting Telescope of a small magnifying Power; larger Powers being apt to dilute the Shadow too much, and thereby render these Phases more uncertain.

A Computation by Dr. <i>Halley's</i> Tables	} 6 ^h 52' 0"	Apparent Time.
gave the Beginning		
End	: 9 14 58	

XIII. *An Account of an extraordinary Meteor seen in the County of Rutland, which resembled a Water-Spout, communicated to the President, by Tho. Barker, Esq;*

Read Dec. 14. 1749. **S**EPT. 15. 1749. a remarkable Meteor was seen in *Rutland*, which I suspect to have been of the same kind as Spouts at Sea; being much like the Account of two seen at *Hatfield* in *Yorkshire*; *Phil. Trans.* No. 281. p. 1248. and No. 284. p. 1331.

It was a calm, warm, and cloudy Day, with some Gleams and Showers; the Barometer low and falling, and the Wind South, and small. The Spout came between 5 and 6 in the Evening; at 8 came a Thunder-Shower, and Storm of Wind, which did Mischief in some Places; and then it cleared up with a brisk N. W. Wind.

The earliest Account I have was from *Seaton*. A great Smoke rose over or near *Gretton*, in *Northamptonshire*, with the Likeness of Fire, either one single Flash, as the Miller said, or several bright Arrows darting down to the Ground, and repeated for some Time, as others say. Yet some who saw it, did not think there was really any Fire in it, but that the bright Breaks in a black Cloud looked like it. However, the Whirling, Breaks, Roar, and Smoke, frightened both Man and Beast. Coming down the Hill, it took up Water from the River *Welland*, and passing over *Seaton* Field, carried away several Shocks of Stubble; and crossing *Glaif-ton*,

ton, and *Morcot* Lordships, at *Pilton* Town's End, tore off two Branches, and carried one of them a good way. In a Hedge-row in the Meadow, at Right Angles to the Spout's Course, stood an Oak and an Ash 15 Yards asunder; the Oak a young sound one, 16 Inches thick, it split two Yards down, and one Half fell to the Ground, but was not quite parted from the other; the Ash, about 8 Inches thick, was torn off in the Middle, and carried 10 or 12 Yards. Between and on each Side of these Trees were other smaller ones, which were not hurt: I heard of no Harm it did after, but breaking and scattering a few Boughs. I saw it pass from *Pilton* over *Lyndon* Lordship, like a black smoky Cloud, with bright Breaks; an odd whirling Motion, and a roaring Noise, like a distant Wind, or a great Flock of Sheep galloping along on hard Ground; it was divided into two Parts all the Way it went, and tho' there was no Wind, moved apace from S. by W. to N. by E. As it went by a Quarter of a Mile East from me, I saw some Straws fall from it, and a Part, like an inverted Cone of Rain, reached down to the Ground. Some who were milking, said it came all round them like a thick Mist, whirling and parting, and, when that was past, a strong Wind for a very little while, though it was calm both before and after. It then passed off between *Edithweston* and *Hambleton*, but how much further I do not know.

XIV. *An Enquiry into the original State and Properties of Spar, and Sparry Productions, particularly, the Spars, or Cryftals found in the Cornish Mines, called Cornish Diamonds. In a Letter to Emanuel Mendez da Costa, Esq; F. R. S. from the Rev. Mr. Wm. Borlace.*

S I R,

Read Dec. 14, 1749.
May 3, 1750.

S I N C E among your Searches into Natural History, you think it worth your while to be particularly inquisitive after our crySTALLIZED Spars, commonly called *Cornish Diamonds*; I will give you the best Information I can concerning them, assuring myself, that you will make proper Allowances for the want of such Assurances as are not to be had in my present Situation.

I shall consider Spar here as the Genus, at the Head not only of all the Species of common Spar, and Incrustations of what Colour soever, but of Cryftals and Gems, which are here understood only as finer and purer Substances of the Spar Kind (1).

There

(1) The Properties of Crystal assigned by a late Treatise (*Mr. Hill's Nat. Hist. of Fossils*), such as keeping itself unaffected by Acid Menstrua, remaining unaltered in a moderate Fire, and giving forth Sparks of Fire by Collision (whereby that Author distinguishes it from Spar), are here reckoned, rather to be accidental and classical Differences, owing to a purer stony Juice, less friable and

There are several Sorts of these sparry Productions, which are carefully to be distinguish'd from each other; but they may all be considered, first, with regard to their original State, or what they have been; and, in the next Place, as to what they now are, that is, as to Form, Size, Colour, Hardness, Texture of Parts, and Direction of their Shoots in the Mines or Quarries. These Particulars, separately discussed, may possibly lead us to several probable Conjectures concerning the Original and most distinguishing Properties of these Bodies, such as may afford some Light to this perplexed and intricate Subject,

SECT. I.

That all Spar has been, at one time or other, in a State of Fluidity, may be maintained, I think, with great Reason, as well as supported by the Authority of some of the most eminent Naturalists (2). In some Spars are found Straws, and other light Bodies; and we may therefore as justly conclude them to have been once fluid, as the Amber that incloses the Bee. In some Stones, whereon were sparry Concretions,

and terrene than that of the common Spar, than to any essential and radical Difference in the Principia of these Bodies. [“There is in “all Spar more or less of Crystal.” *Woodward's Nat. Hist. Fossils*, t. 8.] For many Spars there are, which are opaque, and yet in the same hexagonal Form as Crystals, whence it appears, that Spar and Crystal do not differ in Substance and Nature, but in Transparency, Colour, and different Degrees of Purity. “Spars much the same with Crystal,” says Dr. Plot, *Oxf.* p. 98. §. 52. And Boetius doubts not, but they (*viz.* Spars) are of the same Matter with Gems, *ib.* §. 53.

(2) *Woodward's Catal. of Foss.* Vol. 1. p. 151, and 157. No. 73. *alibiq. passim.*

Dr. Woodward found Fragments of Shells, and Pellicles of the Ova of Fishes; a certain Evidence, that this sparry Production was not anterior to the Deluge; for the Stone must have coalesced and hardened upon the Shell, before the sparry Concretion could have fixed upon the Surface of the Stone; and as I apprehend, the Learned are now very well satisfy'd, that such extraneous Fossils as are mentioned above, are not the *Lusus Naturæ*; but the Exuviz of Animals brought where we find them by the Waters of the Deluge.—Where-ever any Number of the shotten Spars occur, there may be seen successive Incrustations and Crystals fixing on other Crystals, some Incrustations broken off, and shewing their concave Base, shaped by the Cuspis or Apex of the Diamonds on which they were once fastened; which shews, that there has been a Succession of separate and distinct Indurations. — In several Places we find wavy Processes* formed in thin Plates, on the perpendicular Sides of the Rocks, by the Spars flowing down in the same Manner, as one Wave succeeds another on the Sea-Shore; to which we may add, the frequent Formation of sparry Efflorescences, Accretions on Walls, and Stalactites hanging down from the Vaults and Caverns of deserted Mines, Evidences sufficient of the modern Date of such Productions. That we may the easier apprehend this Truth of Spars having been once a Fluid (upon which much depends), it may here be observed, that something very like this Process, (I mean Liquors' hardening into Stone) is commonly seen in the Effects of petrifying Waters; where as soon as the stony Juice

* See Tab. V. Fig. 22.

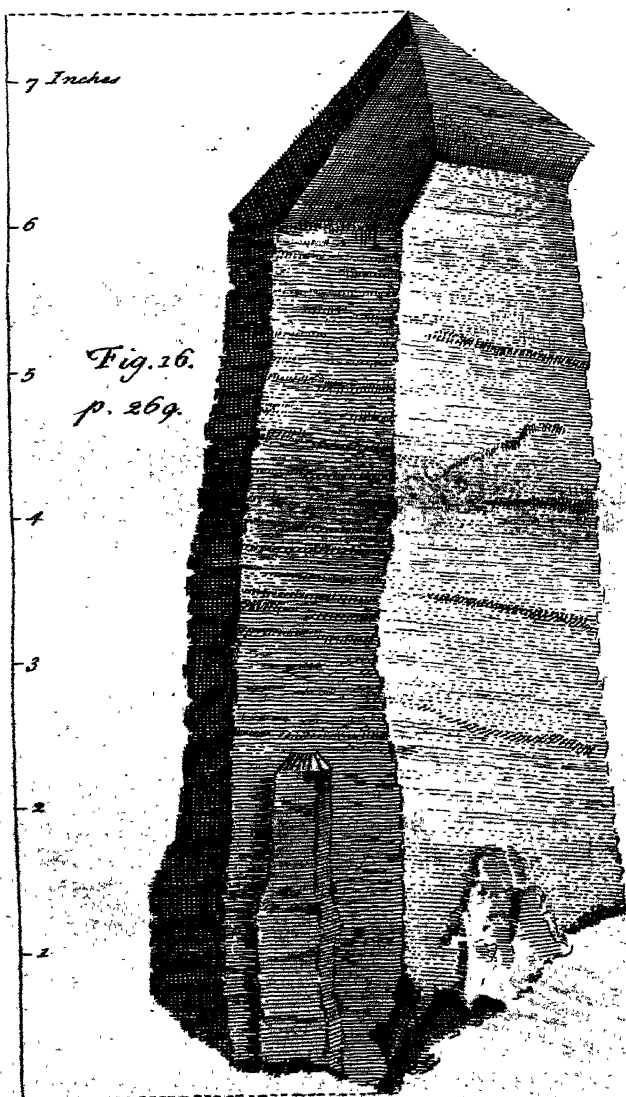


Fig. 22. p. 252.



Fig. 3.
p. 260.

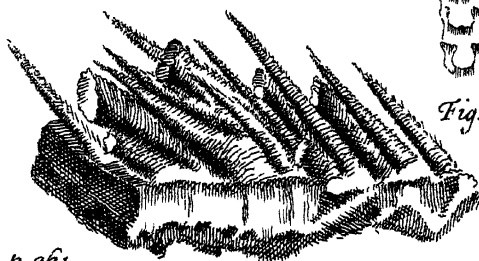


Fig. 4. p. 261.

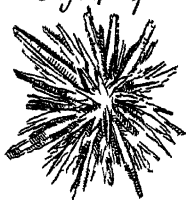


Fig. 5. & y Base of
Fig. 4.
p. 261.



Fig. 19. p. 277.

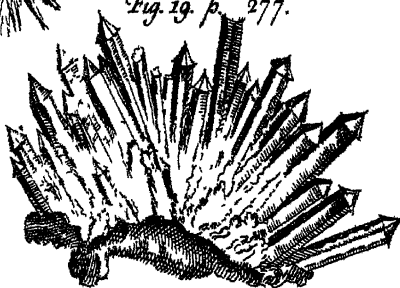


Fig. 2.
p. 260.

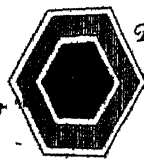
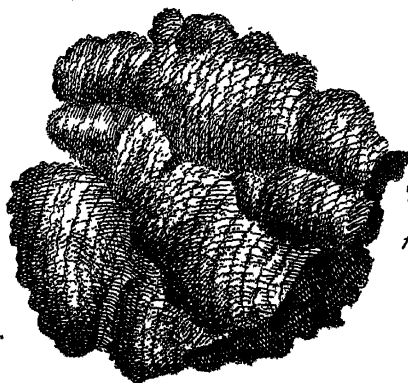


Fig. 17.
p. 274.



Fig. 18.
p. 277.

meets a proper Nidus of Wood, Reed, Grass, or the like, it will forsake its State of Fluidity, and become a solid Stone: Why then should it seem more unaccountable or difficult, to conceive that the same Alteration should happen in the Bowels of the Earth, and in larger Masses of Matter? For as the same Cause will in like and equal Circumstances produce the same Effect, so to produce a greater Effect (*viz.* an Alteration of Form or Motion in a greater Quantity of Materials), there is need only of a proportionably greater Force in the Cause; it being as easy for a powerful Effort to produce a Rock, or a Mountain, as for a smaller Force to congeal a Pebble, or form the smallest Gem. If it were possible, therefore, for us to be as attentive Witnesses of the Changes which happen under the Surface, as we are of those which appear on the Banks of every petrifying Spring, we should discover many new Stones produced every now-and-then, which by their Firmness appear now to have been as old as the World (3). It is indeed a vulgar Mistake to imagine, that Time has added, or shall add, to the Firmness of a Spar; or because it is so hard and compact a Body, that it cannot therefore but be as old as the first Formation of Things; for Spar becomes as hard at the first Time of its consolidating, as it will be ever after, as we find by the exact

(3) Since the Writing of the following Treatise, Mr. *Hill* (*Nat. Hist. of Fossils*, p. 157), by a curious chemical Investigation of the lapideous Contents of Water, says, "That Stones and Minerals, formed of Crystal and Spar, need not be supposed all of them as old as the Creation or Deluge; but may be, and unquestionably are, formed to this Day."

Shape, and the smooth Sides which *Cornish Diamonds* make in Incrustations, and all after and secondary Concretions. This sparry Liquor is stiff and sluggish, and apt to harden; but it is a Liquor however, before it becomes a Stone. — Nor is this Opinion singular, but adopted by many of the Moderns as well as Antients. *Pliny* (4), from the Resemblance that Crystals have to Water, carried this Hypothesis much too far, and thought them to be nothing more than Water congealed by excessive Cold; and *Diodorus* esteems them no better than a Concretion of pure Water, assigning however a different Cause, concluding them harden'd by a divine Heat. *Agricola* makes the *Succus lapidescens* the original Matter of which Stones are formed, some by the Heat, others by the Cold (5) they meet with, during the State of Fluidity (6). Mr. *Geoffroy's* Hypothesis supposes Crystal to be formed of thin equable Plates, that Water is the Vehicle of crystalline Parts; and when those Parts meet together in any Quantities, the Water easily evaporating leaves the Crystals to form themselves into hard, pellucid Bodies. Mr. *Boyle's* Opinion was, that these Bodies were originally in a fluid State (7).

(4) *Lib.* 37. *l.* 2.

(5) “*Utrouque enim modo effici potest Lapis.*” *Ag. de Ort. Subt. Lib.* 4. *Basil. Edit.* p. 57.

(6) *Ib.* p. 56.

(7) See *Boerhaave's Theory of Chemistry*, by *Shaw*, *Not.* 120.

SECT. 2.

Whence this Fluidity.

'Tis Water that first occasions, and afterwards maintains, this Fluidity; and the Reason why we find none of this sparry Mass in its fluid State, nor ever see this lapideous Juice, is, because that whilst it remains incorporated with the Water, it is not to be distinguish'd from the Liquor in which it swims; and as soon as ever it is deserted by the Water that circulated it in the Bowels of the Earth, and other necessary Circumstances concur to produce that Change, it becomes Stone: By Water it is that the sparry Atoms are washed forth out of their Repositories (8), collected into a thick, transparent, or opaque Juice (the stony Particles attracting each other as much as the intermediate Water will give leave); and as soon as the redundant Water is drained off, or evaporated, the lapideous Parts (now more at Liberty) accede to a closer Union, and are assisted greatly therein, as well by the condensing Nature of Cold, which compresses the Parts, and forces them nearer one to the other, as by sudden evaporating Heats; and thus the Stone forms itself, so much Water resting in the Pores and Interstices of the Parts (in proportion to the Number and Magnitude of those Pores), as is neces-

(8) *Woodward's Nat. Hist. of the Earth*, 2d Edit. p. 189.

"Water is the only Agent that educes the Matter, of which they (viz. Spar and Crystal) consist, out of the Strata, and compiles and forms it in the perpendicular Fissures." *Woodward's N. Hist. of Foss.* Vol. 1. p. 150.

fary to fix it into a Consistency ; for, as I apprehend, there is no compound Body, but by means of the Chemist's Fire will yield some Water ; but as soon as all the Water is thrown off, the Body loses its Hardness and Continuity, and turns to a Calx and Powder.

Here, Sir, I beg Leave to propose a few Queries to you.

1st Query, Whether Spar is not the universal Gluten of Stones, distinguished from each other by the various Mixtures of earthy, mineral, or metallic Particles, but all united by the sparry Liquor ? Of this I should be glad to have your Opinion ; for it seems to me, that there is scarce any Sand, Nodule, Stone, or Ore, which either by the naked Eye, or Glasses, may not be discerned to have a certain Portion of Spar, clear, or opaque, in its Composition.

2d Query. Whether it is not reasonable to believe, that Stones in all Ages have been, and are still forming in the Earth, in some such Manner as is here mentioned, whenever the necessary Materials and Cause concur with proper Incidents ?

3d Query. Whether this Hypothesis is not better adapted to account for testaceous, and other extraneous Bodies, found inclosed so often in Masses of Stone, than Dr. Woodward's Supposition, that all Stones were reduced into a fluid Mass by the Waters of the Deluge ; which Waters being those of the Ocean, we cannot allow to have any such dissolving Power

Power inherent in them, and therefore they could produce no such Effect?

4th Query. Whether there are not Quarries of Stone, which when left idle, or unwrought for some Time, yield a fresh Supply of Stone in the Chancels and Hollows of the said Quarries, which had been before thoroughly cleared by the Workmen (9); and whether this will not confirm the Supposition, that Stones formed since the Deluge, in Places where Shells, Teeth, and the like Bodies, were deposited by the Waters, inclosed them in their Substance?

You will excuse this Digression.

SECT. 3.

Different Appearances of Spar.

Our *Cornish* Spars are either plain, simple, and unfigured, or figured into various and rectilineal Shapes.

All sparry Liquor is in itself stiff and sluggish, and covers no Shape; but, being intimately mixed with Water, which is the restless Agent, to disperse, collect, and renew all subterraneous Nature, it moves as a Fluid by the Rules of Gravitation, that is, from an higher to a lower Position, till meeting with a retentive Bed, the Water no sooner retires, and leaves it exposed to a drier or colder Air, than it dries, and hardens into Stone, in Shape and Size, as the Attraction and Quantity of its own Parts determine, or

(9) See *Addison's Travels into Italy*, and Bp. *Burnet*.

the circumambient Bodies will give it Leave to fix and extend itself.

Plain Spars.

Sometimes we find the sparry Liquor spread into thin Plates on the horizontal or oblique Planes of Rocks; sometimes we trace it in Sheets down the Sides of Fissures; and where it meets with Impediments of Gravel, or Stone, it will resemble branched Limbs, Clay, Boughs, and Stumps of Shrubs; sometimes it drops from Vaults, and Roofs of Caves, whence it has the Name of *Stalactites* (10). In all these Cases it is plain, that the Juice had no other Motion, whilst a Juice, nor appears in any other Shape now a Stone, than what its own Weight or Gravitation, during its State of Fluidity, inclin'd it to. In these uninform'd rude Productions, it is very plain, I think, that the Juice wanted those active Principles (whatever they be), which enable it at other Times to shoot into regular Forms.

Fig. 1. TAB. IV. (11). is a Spar Pebble, its Surface about the Roughness of the Peach-skin, inclosed in Part of its Socket, which is also of Spar, angular, and puculated (which latter Property is rarely met with): The Coat or Socket is mixed with solid white Mundic, and Cockle; which last (or the same Principle, which throws Cockle (12) into this oval Figure) seems to have determin'd this Spar to its singular, *viz.* orbicular Shape; for it is observed, that

(10) It also veins or granulates, or both, every Kind of Stone; and is oftentimes found to compose whole Loads or Veins, without any metallic or mineral Mixture, or any particular Shape, more than the Fissure in which it rested compressed it into.

(11) *N. B.* The following Figures, referred to, are intermixed in TABB. IV. and V.

that where Cockle is plenty, Spar-Nodules round as Musket Balls, and black, in Sockets of the same Colour and Substance, are frequently found.—But as this Pebble was not black, as Cockle always is; it may therefore be questioned, whether the Shape of it may not be owing to some metallic (*viz.* Iron or Copper) Principle, rather than to Cockle, and whether Cockle itself be not more probably indebted to other Powers for its orbicular Nodules, in such Sheaths, than derive them from any inherent Activity of its own.—The Exterior of the Shell or Socket has a thin Incrustation of gritty cinerous Mundic.--- It came out of *Wheal Royal Mine*, in the Parish of *Cambron, Cornwall*.

Of Incrustations.

The next Appearance of Spar Bodies, which I shall here take Notice of, is that of Incrustations; these sometimes make one continued Sheath, Lump, or Mass, and inclosed in them we find *Cornish Diamonds*, Grains of Tin, and other adventitious Bodies, plainly of a different Texture and Colour from the Crusts which surround them; so that Incrustations must be cautiously distinguished from the entire Sheaths, or Laminæ, which compose the Column of hexagonal Crystals, and which are really form'd at the same time with that Column (13); whereas Incrustations are additional, and after Concretions made on the before settled original Grains and Columns, (14) sometimes these Incrustations, are but Sprink-

(12) Cockle is a black, shining, light Stone, free of all Metal, different from Mock-Lead, common in the Tin Mines of *Cornwall*.

(13) See p. 274. Note 26.

ings of the crystal Drops, without any Continuity, or mutual Contact; and in this Case, when the pearly Drops are themselves bright and transparent, and the Stone they fix on, of an Agate Colour, or any lively Opposition, the Incrustation is exceedingly beautiful. On one shotten blister'd Spar, I find the Incrustation white, not pellucid, flowing in parallel Threads by each other (*Fig. 2. TAB. V.*), in several Places passing from one Tubercle to another, without touching the interspers'd Hollows; by which I conclude, that this Spar was fixed on the perpendicular Side of a Fissure; that the Juice of this Incrustation was of the *Stalactites* Kind, and, proceeding from the same Cause, descended in a similar Direction.

Fig. 3. TAB. V. Is a Bunch of semi-pellucid Spar, shot into reclined Cones, making an Angle of 30 Degrees, with the Surface of the Stone; the Sides of these Cones are a very curious Fretwork of little Spires or Bristles, many of them sharp as the smallest Needle, and pointing nearly in the same Direction, as the Cone on which they rise. The Surface of these Shoots is of a ferrugineous Tint, but their inner Substance pellucid, very little short of that Spar, which for its Clearness is called Crystal, and

(14) Incrustations are so many evident Proofs of Stones not being formed all at the same Time; for many *Cornish Diamonds*, and columnar Shoots of Tin, Cubes of Mundic, and Grains of Lead are often broke off from these their Inclosures; but the angular Cavities, with their strait Edges and smooth Sides, still appear in the Incrustation; which plainly shews, that the Diamonds and Tin Shoots, &c. were first form'd and harden'd, and then surrounded and united into one Lump, by a successive Induration of these Crystal or Spar Crusts.

and more transparent than many hexagonal Shoots ; 'tis the only one I have seen of its Kind.

Fig. 4. TAB. V. Is an Afterisk of the clearest Spar; its Shoots or Rays are hexagonal, swelling, or gibbous, in the Middle; their Sides not plain, or of one level Surface, as our *Cornish Diamonds* generally are, but ridg'd near the Edges, and somewhat hollow, but not uniformly, in the Middle; the Points or Terminations were entire and sharp, but not to that Degree aculeated as the former conic Spar; but it is very plain, that these Spires never had any hexagonal Apices: The undermost Shoots spread horizontally; but the other rise gradually, making a greater Angle, till the middle ones make nearly a right Angle with the Base, which has a ferruginous circular Spot in the Middle, from whence the Rays regularly proceed on every Side. *Fig. 5. TAB. V.*

These are some of the most singular Spars which have reach'd my Observation; but the general Shape of our figur'd Spars is hexagonal; and these Hexagons either consist of a Shaft or Column, and a Point with the same Number of Sides correspondent to the Column (*Fig. 6. TAB. IV.*) or are only Points, that is, pyramidal Hexagons stuck on at their Base, upon the Surface of their stony Beds. *Fig. 7. TAB. IV.*

In a thin Cake or Lump in my Possession, one Half of the Spar shoots from one Side, the other Half from the other; and so incrusts the Planes of both Sides with hexagonal *Apices*. *Fig. 8. TAB. IV.*

Here the Spar (as appears by the Tendency of its Fibres, when the interior Texture is examin'd) struggled to form Stems or Stalks to these *Cuspides*; but either the Effort was not vigorous enough, or, through the Impurities of the Juice, the sparry or crystalline

crystalline Principles had no room to extend or protrude themselves into the Shape they seem inclinable unto; so they lie blended, and their Lincaments scarcely to be distinguish'd from the general Mass.

Some Spars rise out of the general Surface, into large orbicular Blisters, thick set with hexagonal Points diverging, as Rays from a Center. *Fig. 9* TAB. IV.

These Blisters or Protuberances are in other Spars subdivided into Numbers of other small, orbicular Excrescencies, and the *Cuspides* very small, but, like the pointed Shoots of most *Cornish* Spars, hexagonal. *Fig. 10.* TAB. IV.

At the Root, or where they join to the Rock, these globular Masses shew in what Direction the Juice exerted itself, springing commonly, as from one general Center, and extending itself equably on every Side. When the Juice is simple, and of one Sort only, the Rays are continued from the Center to the Extremities; as *Fig. 11.* TAB. IV. But when the Juice is of two or more different Mixtures and Impregnations (which will generally appear from the different Colours and Degrees of Transparency), then the Effort is various and successive, protruding the Juice according, and in proportion to the different Activity of the *Stamina*, of which it consists; and in both these Cases I find the coarsest and most terrene Part of the sparry Lump next the Center, and the most transparent and purest shot forth, to form the pyramidal *Cuspides* of the Circumference. Though the Effort is various and multiple, the several Juices preserve a Parallelism to each other, and to the Extremity, each Juice proceeding no farther than its

Fig. 11. p. 262

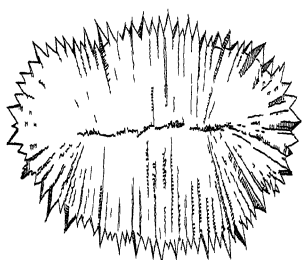


Fig. 1 p. 258.



Fig. 20. p. 278



Fig. 21. p. 279.

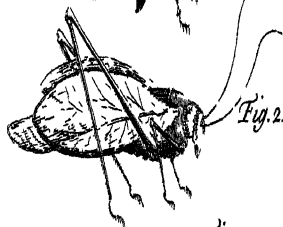


Fig. 12. p. 263.

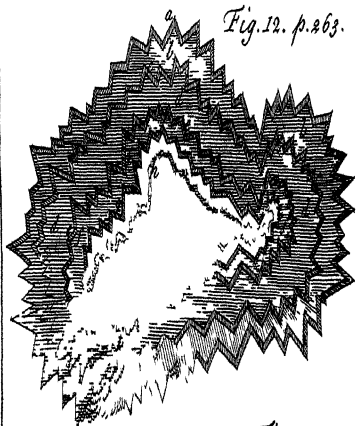


Fig. 6. p. 261.

Fig. 7. p. 261

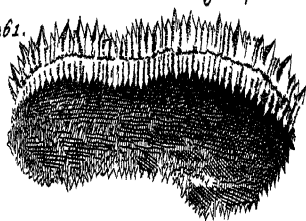


Fig. 9. p. 262.



Fig. 14. p. 263.

Fig. 13. p. 263.

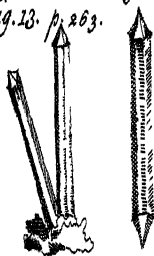


Fig. 15. p. 263.



Fig. 10. p. 262.



own Impregnation would carry it; and therefore settling in parallel Lifts or Lines behind each other, and their Angles less and less perfect, that is, becoming more obtuse, till you come to the Rock, or lifeless Lump of Spar, which the Effort had no Power to move, and thro' which the impregnated and purer Juices escaped, according to their Degree of Mobility: The Base of one of these orbicular Lumps, which has seven distinct Lifts or Fillets one within the other, besides lesser Lifts, mark'd (*b*), will explain what is here suggested. *Fig. 12. TAB. IV. ‡*

These hexagonal Points do not always sit close to the Body of the Rock, but are as often found mounted upon columnar Shoots of the same Number of Sides; and these are what are commonly called *Cornish Diamonds*: They are generally found larger somewhat at the Base, where they fasten on the Rock, than at the Top, where they support the *Cuspis. Fig. 13. TAB. IV.*

Some of these Shoots have also hexagonal Points at each End, as *Fig. 14. TAB. IV.* and are sometimes found single, that is, detach'd, and without a Root, as the Naturalists say; but I have them also in Lumps fixed Side by Side, but in no parallel Direction. *Fig. 15. TAB. IV. (15).*

This

-
- ‡ *a.* The clearest Crystal.
b. Sup-pellucid, inclining to purple.
c. Flock-white, not pellucid.
d. Large Fillet of purpled Spar.
e. Flock-white.

- f.* Small Fillet of purpled Spar.
g. Flock-white.
h. Lifts of Spar less distinct.
i. That Side on which the Effort was faint, and the Shoots scarce perceivable.

(15) These Shoots are not always straight, but are found sometimes bent or crooked; but as this Deformity is owing to some accidental inter-

This is the general and most common Appearance of our *Cornish* figur'd Spars and Crystals, *viz.* either hexagonal Points on the Rock, or common Spar, or fixed on Shoots or Columns of the same Figure; but we must not imagine, that Spar assumes no other Shape, but what has been here mentioned. There are also trigonal and cubical Spars; but of these Sorts I have not yet seen any in *Cornwall*; however, as our Observations in this inquisitive Age are daily growing more extensive, it is very probable, that new and undescribed Shapes of Spars may often fall under our Notice: What I have here mentioned seem most worth notice; but to pretend to number them all, would be very extravagant; for they are varying every Day upon our Hands, and new Mines throw forth new Forms, according to the different Combinations of their Solids, and the Impregnation of their Waters.

S E C T. 4.

Whence the hexagonal Shape of Spars.

It has been observed before, (*p.* 257.) that Water and the sparry Juice, considered simply, without any other Aid, will produce only the irregular, shapeless Masses of Spar, incapable of any Activity, or Struggle towards Shape and Figure, and determined only by the common Principle of Gravitation, to that Position in which we find it: We must
call

interposing Force or Obstruction, during the Time of forcing, it will not, I apprehend, make the Body of a different Species, as long as all the other common Properties are continued.

call in therefore the Assistance of some other Principle, to account for the rectilineal regular Phænomena of these sparry Productions.

As the general Appearance of our *Cornish* Spars is hexagonal and uniform, there must be some one general Principle to which this great Uniformity is to be referred. If these Spars owed their Form to any metallic Principle, that Metal would be found, when the Fluor was thrown off by Fire: But the contrary is apparent, the clearest Spars yielding no Metal. And, indeed, it may here be observed, that when the stony Juice meets and coalesces with any metallic Particles, that Juice shoots not into its natural Form, but by Tin is forced into Prisms, and various *Speculums*; by Lead, into Cubes; and by other Metals into other Forms: So that it never retains its hexagonal Shape, but when free of Metals. As therefore there is no Metal in our regularly-figur'd Spars, we must have recourse to another Origination; and Salt, as I take it, is most likely to be that active Principle, by whose Force the Fluid in which it is mix'd, be it pure Water, or lapideous Juice, is made to shoot forth into regular rectilineal Masses, agreeable to the original Shape and Figuration in which these Salts were first created. 'Tis by the Force of Salts that liquid Bodies are thrown into all the geometrical Planes, Angles, and more compounded Shapes, the Variety of which is no less surprising, than the Constancy and Uniformity of each particular Species; the same Salt shooting still into the same Figure (as is plain from all artificial Crystallizations), when not streightened in Room, or otherwise determined by heterogeneous Mixtures. To produce Salt

from any liquid Body, two things are requisite: First, that the redundant Liquor, in which the saline Particles are kept too dispersed and remote to attract each other, be discharged (which is usually performed by Evaporation), and that the Remainder be exposed to a colder Air. This simple plain Process will produce all the Varieties of Crystallization; the Salts contained will shoot into their peculiar Forms, pointing forth their Darts, regular Planes, or Spires, into such Figures as are proper either to their native or compounded Salts. From this easy and incontestable Procedure of Liquids into figur'd and solid Bodies (to which nothing more is required than Heat and Cold), may it not appear probable, that something like this has happened, and does still happen, among our Spar-Loads in the Mine? For Instance: When the Juice of Spar, impregnated strongly with Salts, which have been from time to time imbibed, is sufficiently drained from the Water (which not only collected the sparry Mass, but kept it in a fluid State), either by natural Heat, so common in Mines, or by the Water's running off into Crevices, where the stiffer Stone-juice cannot follow it; in other Words, when the Water deserts the Spar; the Spar, as soon as a colder Air succeeds (16), shoots, and is protruded into Figures by the Salt which it contains (17); and thus

(16) "*Crystallus est succus, quem frigus intra terram conglutinavit.*" Agric. p. 282.

(17) Mr. Boyle's Opinion is, that such Stones (*viz.* Spars and Crystals) were originally in a fluid State; that the Figure of them is determinate and geometrical, like the Crystals produced by Alum, Nitre, Vitriol, in Water; and their Texture like the Congelations of Salt produced in Crystallization by Cold.

thus it happens that we have such figur'd Bodies from the Spar, which, without those Salts, would shew us no such Shoots as we call *Cornish* Diamonds, but fix quickly into Sheets, and even Plates, or drop down where-ever its own Weight would carry it.

What sort of Salt it is, which inclines Spar to this hexagonal Form, is the next thing to be inquired into; and most probably will appear to be that of Nitre, if we consider that the Resemblance betwixt the Figure of what we call *Cornish* Diamonds, and that of the pure unmix'd Nitre, is so great, that no two things can be more exactly alike. "The known Figure of Nitre, says *Grew* (*Cosmol. p. 15.*) is a sexangular Prism." "Particulas nitri *Listerus* deprehendit sexangulas, tenues, longas, lateribus paralleogrammis, & ex altera parte in pyramidale acumen desinentes." *Phys. Cler. 8vo, tert. Edit. p. 150.* This exact Resemblance is sufficient to make us conjecture, that these sparry Productions may owe their general Figure to a nitrous Salt, which exerted itself at the time when the Juice of Spar became Stone; and I shall endeavour to support this Conjecture only by one Authority, which is that of the curious, and, in the Studies of Natural History, indefatigable *Linnaeus*, which he favoured me with in Answer to some Queries, jointly with the Opinion of the present Dr. *John Frederick Gronovius* of *Leyden*. "The Origine of those Crystals (18) is a most intricate thing; but you may conclude---*quod omnis crystallizatio a*
L 1 2 "sale,

Grew (*Cosmol. p. 14.*) after talking of the Regularity of Forms, and the Salts of Bodies, proceeds thus: "Arguing (says he) that the Atoms of the lapidific, as well as of the saline Principle, being regular, do therefore concur in producing regular Stones."

(18) *Cornish* Diamonds, sent to Dr. *Gronovius* from *Cornwall*.

“*sale, quod crystalli gaudent figura nitri, quodque omnes generentur in cavo: Hi (viz. crystalli) quo magis simplices, eo magis puri & pellucidi: Hinc nitro originem debent, quemadmodum gemmæ istæ, quæ prismaticam nitri figuram exhibent.*”

As Nitre may be reasonably conjectured to give the ordinary and general hexagonal Figure to Crystals, it may be as justly inferred, that when they depart from this Uniformity, it is owing to some mineral, earthy, or metallic Mixture, some heterogeneous Salt, which impedes the Nitre in its shooting, and turns it into trigonal, cubical, conic, or other unusual Figures.

SECT. 5.

Of their SIZE.

The next thing to be considered, is the Cause to which the different Size in which these Bodies do appear may be owing. Some Crystals are said to be a Cubit high: *Livia Augusta* dedicated one in the Capitol of fifty Pounds Weight (19); and Dr. *Isaac Lawson*, late Physician to the Army in *Flanders*, informed me, that he saw a Crystal in a foreign Mine, with its Edges well preserved, which he believed might weigh about 200 Pounds. Dr. *Woodward* reckons, among his *Cornish* Diamonds, a single Column or Shoot very large, if it be three Inches in Length, and one Inch and half in Diameter near the Base. The largest I have yet seen in *Cornwall* weighs somewhat more than three Pounds, is about ten Inches

in

(19) *Pliny, lib. 37. c. 2.* Sir *Hans Sloane* has one Block of Crystal which weighs between 40 and 50 Pounds, and another about 20, quite clear and regular. C. M.

(20) *Catal. 158. f. 98.*

in Girt at the largest End, and more than seven high; from which Size there are of all Degrees, down to the Bigness of a small Pin. As the Size of this last-mentioned is very unusual, I have given a Drawing of it, *Fig. 16. TAB. V.*

The largest proceed out of a large Courfe or Load of Spar; but the smallest of all from small Bits or Lumps of Spar; and the small pyramidal *Apices* are generally stuck on upon the Side of the large ones, sometimes in distant Spangles, other times in thin and broken Incrustations. Now the Cause of these different Sizes seems to be this: Where-ever great Masses of the sparry Juice have happened at the same time to be in a State of Fluidity, the exuberant Water drained off suddenly, and consequently left Cavity sufficient for the Salts to extend themselves, there the great Quantities of nitrous Salts mixed with the lapideous Juice incline it to shoot vigorously, and form large Crystallizations; and from proportionably lesser Masses, whilst they are indurating, proceed lesser Diamonds. If the whole Mass be impregnated with nitrous Salts, the whole Surface of the Rock shall rise into Points or Spires (21), according as the Mass is more free or more stubborn to comply with the Agitation. If the nitrous Salts are not intimately mixed, but swim in Clouds and Bunches, those Lumps only, where the Nitre is, shall be shot, and the rest be plain. This is the Case when the sparry Juice gets into its proper *Nidus*, or rests in its Fissure. But where small scatter'd Quantities of this stony Juice circulate in the
subter-

(21) See *Fig. 4. and Fig. 3. TAB. V. and Fig. 8. and 11. TAB. IV.*

subterraneous Waters, some trickle down the Sides of Stones and Fissures, and already-formed Diamonds, and, sticking in *little* Globules, form a Crust by Juxtaposition, whose Points are sexangular, their Columns short, sometimes crooked and unfinish'd. At other times Water, charged with these sparry Juices, falling from higher into lower Parts of the Mine, cannot but be dashed and dispersed about the Cavity in all Directions; and thus it is, perhaps, that the distant Spangles, like the Dew or Mist that rises from a Cascade sprinkled on the Surfaces of all Bodies in their Reach, are there congealed, and shot by their Salts.

SECT. 6.

Of their COLOUR.

Spars are of different Colours, and different Degrees of Transparency; some yellow, some reddish, brown, green, purple, black, some of a cloudy fleecy white, some freckled with little Specks of various Colours and Magnitudes, and others of a Water not inferior to the purest Crystals. The Yellow is supposed to be indebted for its Tinge to Sulphur and Iron, or Lead, or both; the Red to Iron, and perhaps *Gassan*, that general Companion of Copper; Green, to the Solutions or Rust of Copper; Copper will also probably impart its Purple (for of that Colour we find some of our most beautiful Copper Ores) to the Juices near it: Black may possibly be indebted to Copper also of like Colour, to Tin, or the Particles of Coal; but the most transparent owe that Advantage to the Purity and Simplicity of the Juices of which they are formed. What this Purity is owing

to, cannot be so easily determined. Some think to Percolation, or straining through the Pores of other Bodies, the lapideous Juice depositing the Sediment and Impurities, which it may have contracted in its Passage. Now, it is not impossible but that the Water, and that liquid Spar, of which these Bodies are principally formed, passing by their own Weight thro' a soft, porous, sandy Stone in the *Oxford, Bath*, and other-like Quarries, may undergo a Change for the better, and acquire a greater Degree of Transparency; but it cannot be so with our Spar, on which we find the Crystals above-mentioned: For, besides that these Crystals are found on both Sides the Stone (22) (which, in the Procedure of Percolation, could never happen), and in very large Shoots, our Spar will no more transpire or exude than Glass, it is of such Consistency and Hardness: So that whatever Filtration has happened to these Crystals, must have befallen them during a former Percolation, before they rested in their present Beds, not from any sweating thro' that Bed in which we find them, as Dr. *Plot* imagines (23).

Crystals therefore, it is certain, owe their Transparency and Purity to the simple State of the Juices that form them; but to what that State and Condition is owing is uncertain. Whether it may be to some purifying Menstruum or Spirit, that precipitates every kind of Sediment, I do not presume to say: I shall only observe, that in *Cornwall* the clearest Diamonds are for the most part found in a dry, lax, sandy Soil, where

(22) See Fig. 8. TAB. IV.

(23) *Oxfordsh.* p. 98. and *Ramondus in Alonso Barba*, p. 36

where no dirty or dark-colour'd Loam, Mineral, or opaque Stones prevail : So we may conclude in general, that if, during the Fluidity of these Bodies, no metallic or mineral Fume, no Dust, Clay, or Sand, was imbibed, the Water and lapideous Juice make up a clear pellucid Mass. If the Case was otherwise, whatever Impurities the Waters contracted, and had not at the time of forming discharged, are still to be seen in the Stone.

SECT. 7.

Of their HARDNESS.

As to the Hardness of our *Cornish* Crystals, all I have to observe is, that they cut well into Seals, when they have no Flaws : Their natural Points also will cut Glass; but not freely or deep; in which Particular they fall much short of the true Diamond.

Conjectures relating to the Properties of the true Diamond.

Of this I shall not pretend to assign any other Reason, than that the true Diamond seems to have more lapideous Juice included, and more intimately and congenially united under an equal Surface, than any other Body in the World. It has also very little Salt in it, as Dr. *Grew* observes (*Cosmol. p. 14.*); and his Opinion is confirmed by its being found in such small Masses; and by its great Weight it can have little Water; both which Observations are supported by its great Resistance, and almost Immutability in Fire : So that the true Diamond has little Salt, and little Water, consisting almost intirely of stony Juice con-
creted;

creted; to which Properties its great Hardness may therefore be attributed: Whereas in our Diamonds there is much Salt, and much Water (comparatively speaking); which two Ingredients, mix'd with the lapideous Juice, may incline those Bodies to be more friable and tender, and deprive them of that Hardness, which a less-reduced lapidific Juice would certainly have had. This seems to me the real Cause of the true Diamond's Hardness, and of our false ones falling as much short of it in this Particular, as in Lustre: But I must acknowledge, that, for want of sufficient Experiments relating to both, I cannot decide peremptorily. However, by weighing the *Cornish* Diamonds in Water, I find they are generally to the Weight of our common Water, at a Medium, as $10\frac{1}{2}$ is to 4; and I apprehend, that if they had more lapideous Particles, they would weigh more, as they find the true Diamond really does*. I find also the clearest and brightest *Cornish* Diamonds weigh much heavier than the other which are more shady and opaque. That they have much Salt also, may be concluded from their being projected sometimes into such large, regular, hexagonal Columns.

SECT. 8.

Of the TEXTURE *of* Cornish Diamonds.

There are some little Varieties in the Texture of our *Cornish* Diamonds, which are sometimes to be observed in their broken Sides and Edges; but always, and more distinctly, in their Base. Some are uniform, of one Colour and Transparency throughout;

M m

some

* * The Weight of *Crystals* to Water is as $2\frac{1}{2}$ to 1. of *Diamonds* as $3\frac{1}{2}$ to 1. See these Transactions, No. 488. p. 451. C. M.

some have hexagonal Sheaths described one within another, as in *Fig. 17. TAB. V.* In the first Case, the shotten Juice was of one and the same Nature and Consistency, equally impregnated, and the Production of one Effort; in the latter Case, where the Sheaths are one within another, 'tis also the Product of one Effort or Shoot, the Concretion of one and the same time, as the tremulous Undulations upon the Surface of Water, on throwing in a Stone, are all the Offspring of one Force, tho' the first be strongest, and the rest gradually fainter and less distinct: But the Juices being differently mix'd, gave way to the Effort in proportion to their Sensibility of the Impregnation, the most agile flying off to the greatest Distance from the Center, and the most mix'd, coarsest, and most opaque, remaining nearest the Center (24). That this is the true Process, and that those different Sheaths are the Product of one Effort or Birth, and not formed at different times, and in Succession, as *Steno* and *Aldrovandus*, and some others, say (25), is plain, I think, from the two following Observations, (26). If the Juice which forms these Sheaths was impregnated and shot at different times, it would not form in Sheaths round what appears to be the Central or Master-shoot, but would project itself into its natural hexaedral Figure. If it were not impregnated, but mere Spar only, without Nitre, or any other active Principle, it would form itself, as the Stalactites, in a pendulous undulating Direction, Drop or Wave upon Wave; and in this Case these Sheaths could never surround, in that neat and exact manner, the central Shoot; but

(24) See *Fig. 12. TAB. IV.* and its Description, p. 263.

(25) See *Plor's Oxf.* p. 98. (26) See p. 259. Note (13)

but would be found only on the under Part of that Shoot, where its own Gravity would inevitably carry it: For it would be observed immediately, that these Diamonds in the Mine point forth in all Directions; which must consequently prevent every unimpregnated Juice from hardening into a regular uniform Sheath.

It is also to be noted, that these Sheaths are often found broke and interrupted: But this cannot be owing to their being *Gemmæ inchoatæ & non perfectæ* (27), for the above-mentioned Reasons, but to the Insufficiency and Want of Juice, or to some accidental Impediments of Stone, Earth, or Sand, which make those Breaks, and prevent it from forming a complete Sheath.

SECT. 9.

Of their DIRECTION in the Mine.

Not long since I went with a Friend or two into a Mine called *Pillion Erth*, in the Parish of *St. Just*, on purpose to survey the *Cornish* Crystals in their natural Situation. The Cave, to which we were introduced, was not much larger than a common Baker's Oven, and much of that Figure. We had two Candles with us, by means of which we saw the Roof, which might, in the Middle, be about five Feet high from the Floor; in the other Parts not so much. The Roof was the most surprising Piece of Fretwork imaginable, and consisted intirely of Spar shot into *Cornish* Diamonds, of which the large one (*Fig. 16. TAB. V.*) was a Part. I could not discern any coveting a Position

M m 2

exactly

exactly perpendicular to the Horizon; but in every indifferent Direction they pointed forth very plentifully of several Sizes; sometimes in Groupes and Clusters, sometimes single, now crossing each other, and now standing by each other with parallel Sides: Some were smooth, shining, and clear, others rough and opaque; some vein'd with red, like Porphyry; others speckled thick with the smallest Spots of deep Purple, and a bluish Cast: But the finest of all, were those which had innumerable little Diamonds or Sparks (of the clearest Water) stuck upon their Sides, and, by means of the Candle, had a Lustre not to be conceived. We gazed here in this incommodious, but beautiful little Cave, till we could no longer hold up our Heads; and then crept out as we came in, upon our Knees.

Now, among the great Numbers of sparry Productions which I saw in this Mine, I could not observe, but that they pointed indifferently in all manner of Directions; which I suppose owing to the great Unevenness of the Surface on which the Bases of these little Columns were fix'd; and for the same Reason I doubt not, but in all concave Beds the Points converge, as in all convex they turn the contrary Way, and diverge, as from a Center: So that the natural Cause of these different Directions is probably no other than the accidental Form of that general Mass from whence these Shoots proceed. I would say, that as the Figure and Regularity of the lapidific impregnated Matter happens to be, when drained of all superfluous Moisture, and by the Cold, Heat, or Dryth, disposed to shoot, so will the Tendency of the Shoots, both Column and Point, be. If
the

the concave Part (for Instance) of the *Voluta* of the *Cornu-ammonis* be set with Crystals, their Points must tend inwards to the Center, where the Tail ends, being thereto compelled by the regular Contour of the Shell; and indeed they are so in Fact, as see *Fig. 18. TAB. V.* But if the Crystal Juice chance to fix on, or proceed from a convex Bed (to which its *Nidus*, and other Causes, may contribute), or be itself an orbicular Lump, and equally impregnated on all Sides; then will the Fibres spring as from one common Center, and at their Extremities point forth their *Cuspides* in a circular Figure, as in *Fig. 19. * TAB. V.*

If there be a thin Plate of Spar equally exposed to Cold on each Side, and having equal Room and Force to shoot, it will throw forth its Points on each Side; and the Line from whence the Fibres began to spring shall be exactly in the Middle of such Plate of Spar, and the Figures shall cut the said Line at right Angles, as in *Fig. 8. TAB. IV.* whence it seems reasonable to conclude, that the Direction in which these sparry Productions shoot forth is generally rectangular, or very near it, to the Beds or Masses from which they proceed; and that all the seeming Confusion in Pointings of the *Cornish* Diamonds in *Pillion Erth*, was owing to the great Variety of Planes and Surfaces, into which that large Body of Spar was hardening, when these Diamonds shot from its Extremities.

I am, Sir,

Ludgvan, Oct. 18.
1749.

Your most obedient Servant,

WM. BORLASE.

* See *Fig. 5. p. 261.*

XV. *A Description of the Great Black Wasp, from Pennsylvania, as communicated from Mr. John Bartram to Mr. Peter Collinson, F. R. S.*

Read Dec. 21. 1749. **S**OME Time ago, some Gentlemen

present at a Meeting of the Royal Society *, were pleased to give a favourable Reception to an Account of a particular Species of small Black Wasp, that fabricated its Nest with Clay, in it deposited an Egg, and then stuffed it full of Spiders for the Maggot to feed on, *Transf.* No. 476.

This that I now have the Pleasure to lay before you, has something analogous in its Nature, but is a much larger Insect, and rarely met with in the Province of *Pennsylvania*. The following Observations I have collected from my ingenious Friend *John Bartram's* Letters.

You will see by the Specimen (TAB. IV. *Fig.* 20.), the Size of this *Great Black Wasp*; it supplies itself with Food, by roving about the Meadows, catching Grasshoppers, and other Insects; on these it feeds, and not on Fruits, as other Wasps do.

But what is more remarkable, is the Method of making their Nests, and providing for their young.

With great Pains and Industry they scratch an horizontal Hole, near an Inch Diameter, and a Foot long, in the steep Side of a Bank of loamy Earth; then away the Wasp flies, and catches a large
Green

* April 25. 1745.

Green Grasshopper, and lodges it in the farther End of her Nest; then she lays an Egg, and then goes and catches two more, and deposits them with the other, then plaisters up the Hole. The Egg soon produces a Maggot. These Grasshoppers, by marvellous Instinct, are provided for its Food, until it changes into its Nymph State, in which it lies for a certain Period, and then eats its Way out, and flies away, seeking its Mate.

But what may deserve our farther Attention, is the wonderful Sagacity of this Creature, not only in catching these large Grasshoppers (*See* TAB. IV. *Fig.* 21.), which are very like ours, and are very strong and nimble, as most may have observed that take them up: But their peculiar Skill is to be admired in disabling them, either by Bite or Sting, so as not to kill them; for then they would soon putrify, and be unfit for Nourishment. Life sufficient is left to preserve them for the time the Maggot is to feed on them.

The three Grasshoppers in the Glâss-Case were all taken alive out of one Nest; but they had lost their Agility: Being secured in a Cavity in the Earth, may be a Means to keep them living: When exposed to the Air, they died in a Day or two.

The Sting of this Wasp is painful, but does not swell like others.

XVI. *An Observation of an Eclipse of the Moon, Dec. 12. 1749. made at Earith, near St. Ives, in Huntingdonshire, by Mr. Wm. Elstobb, jun. communicated in a Letter to Martin Folkes, Esq; Pr. R. S.*

Read Dec. 21. 1749. **A**T 7 at Night the Umbra came on the lower Limb of the Moon, almost directly under the Spot called *Tycho*, in *Keil's* Map of the Moon.

At 2 Min. $\frac{3}{4}$ after 7, the Penumbra overspread *Tycho*.

At 6 Min. after 7, the Umbra approached the lower Part of *Mare Humorum*, and *Tycho* immersed into the Umbra.

At 21 Min. after 7, *Mare Humorum* totally immersed into the Umbra.

At 41 Min. after 7, the lower Part of *Mare Nectaris* immersed into the Umbra.

At 57 Min. after 7, the North-East Limb began to evolve itself; and that Part of the Limb below the Spot called *Grimaldus*, began to appear brighter, than when the Penumbra covered it.

At 9 Min. after 8, the upper Part of *Mare Humorum* emerged from the Umbra.

At 21 Min. after 8, *Mare Humorum* totally emerged.

At 45 Min. $\frac{1}{2}$ after 8, *Tycho* emerged from the Umbra.

At 51 Min. $\frac{1}{4}$ after 8, the Penumbra left *Tycho*.

At 54 Min. $\frac{1}{2}$ after 8, *Mare Nectaris* emerged from the Umbra.

At 9, the Penumbra left *Mare Nectaris*.

At 4 Min. $\frac{3}{4}$ after 9, *Mare Fecunditatis* emerged from the Umbra.

At 16 Min. after 9, the Umbra left the Moon a little below *Mare Fecunditatis*.

At 18 Min. after 9, the Penumbra went off, and the Eclipse ended.

At the Time of the greatest Obscuration, the Edge of the Umbra passed below *Grimaldus*; approached the lower Part of *Peninsula Fulgurum*; passed over the upper Part of *Mare Nectaris*, and crossed about the Middle of *Mare Fecunditatis*. The Edge of the Umbra did not seem to make one regular Curve, but looked like two Curves, meeting in a very obtuse Angle near *Peninsula Fulgurum*. And that Part of the Moon, immersed in the Umbra, was not visible.

XVII. *A Catalogue of the Immersions and Emerfions of the Satellites of Jupiter, for the Year 1751. of which there are 172 of the First, 87 of the Second, 62 of the Third, and none of the Fourth, by reason of its great Latitude; in all 321. Computed to the Meridian of London from the Flamsteedian Tables: Corrected by James Hodgson, F. R. S. Master of the Royal Mathematical School in Christ's-Hospital.*

ECLIPSES of the first Satellite of JUPITER.

Emerfions.	Emerfions.	Emerfions.
D. H. M. S.	D. H. M. S.	D. H. M. S.
JANUARY.	19 4 42 14	5 21 30 17
	20 23 10 49	7 15 59 18
1 11 58 56	22 17 39 31	9 10 28 20
3 6 16 58	24 12 8 12	11 3 57 27
5 0 55 4	26 6 36 56	12 23 26 35
6 19 25 17	28 0 5 46	14 17 55 41
8 13 51 35	29 19 25 35	16 12 24 53
10 8 19 52	31 14 3 27	18 6 54 01
12 2 48 15		20 1 23 14
13 21 16 40	FEBRUARY.	21 19 52 30
15 15 45 6	2 8 32 25	23 14 21 54
17 10 3 41	4 3 1 17	25 8 51 1

[283]

ECLIPSES of the first Satellite of JUPITER.

Emergions.				Immersion.				Immersion.			
D.	H.	M.	S.	D.	H.	M.	S.	D.	H.	M.	S.
27	3	20	20	31	20	49	59	6	16	10	4
28	21	49	40					8	0	38	28
MARCH.				JUNE.				9	18	6	53
				Immersion.				11	13	35	21
2	16	19	0	2	15	14	23	13	8	3	49
4	10	48	19	4	9	42	20	15	2	34	10
6	5	17	38	5	5	10	46	16	21	0	51
7	23	46	59	7	22	39	12	18	15	29	25
9	18	16	20	9	17	6	50	20	9	58	9
11	12	45	40	11	11	35	0	22	4	26	39
13	7	15	2	13	6	3	7	23	22	55	20
15	1	44	22	15	0	31	21	25	17	24	3
16	20	13	45	16	18	59	29	27	11	52	46
18	14	43	5	18	13	27	42	29	6	21	27
20	9	12	25	20	7	54	46	31	0	50	15
22	3	41	38	22	2	23	57	AUGUST.			
23	22	10	41	23	20	52	7	1	19	19	3
25	16	39	40	25	15	20	5	3	13	47	53
Immersion.				27	9	48	31	5	8	16	46
				29	4	16	44	7	2	45	39
				30	22	45	2	8	21	14	32
JULY:								10	15	43	29
24	18	52	50	2	17	13	21	12	10	12	30
26	13	21	11	4	11	41	39	14	4	41	26
28	7	49	23								
30	2	17	44								

ECLIPSES of the first Satellite of JUPITER.

Immersion.				Immersion.				Immersion.			
D.	H.	M.	S.	D.	H.	M.	S.	D.	H.	M.	S.
15	23	10	29	25	16	19	17	NOVEMBER.			
17	17	39	30	27	10	48	20	1	20	22	55
19	12	8	33	29	5	17	18	3	14	51	4
21	6	37	36	30	23	46	17	5	9	19	27
23	1	6	40	OCTOBER.				7	3	47	15
24	19	35	46					8	22	15	24
26	14	4	53					10	16	43	53
28	8	34	0					12	11	11	42
30	3	3	7					14	5	39	54
31	21	32	13					16	0	7	56
SEPTEMBER.				2	18	15	9	☉ ♃ ♄			
2	16	1	15	4	12	44	7	Emission.			
4	10	30	29	6	7	13	0	21	9	40	59
6	4	59	32	8	1	41	53	23	4	9	10
7	23	29	24	9	20	10	38	24	22	37	32
9	17	57	44	11	14	39	27	26	17	4	9
11	12	26	52	13	9	8	17	28	11	32	50
13	6	55	57	15	3	36	57	30	6	0	51
15	1	25	2	16	22	5	39	DECEMBER.			
16	19	54	9	18	16	34	21	2	0	28	42
18	14	23	12	20	11	2	56	3	18	58	48
20	8	52	14	22	5	31	32	5	13	24	34
22	3	21	19	24	0	0	5				
23	21	50	19	25	18	28	38				
				27	12	17	7				
				29	7	25	40				
				31	1	54	6				

ECLIPSES of the first Satellite of JUPITER.

EMERGIONS.	EMERGIONS.	EMERGIONS.
D. H. M. S.	D. H. M. S.	D. H. M. S.
7 7 52 22	16 4 12 3	25 0 21 57
9 2 20 43	17 22 40 1	26 18 59 55
10 20 48 26	19 17 8 10	28 13 28 58
12 15 15 47	21 11 35 58	30 7 55 59
14 9 44 10	23 6 3 57	

ECLIPSES of the second Satellite of JUPITER.

EMERGIONS.	EMERGIONS.	EMERGIONS.
D. H. M. S.	D. H. M. S.	D. H. M. S.
JANUARY.	FEBRUARY.	6 19 41 36
1 20 6 0	2 19 48 12	10 9 1 4
5 9 23 14	6 9 7 7	13 22 20 42
8 22 40 48	9 22 25 01	17 11 40 30
12 11 58 24	13 11 45 04	21 0 59 51
16 1 15 56	17 1 4 8	24 14 18 56
19 14 34 20	20 14 23 43	
23 3 52 36	24 3 43 5	MAY.
26 17 11 1	27 17 2 22	Immersion.
30 6 29 38		23 22 2 48
	MARCH.	27 11 19 37
	3 6 22 14	31 0 36 50

JUNE.

ECLIPSES, of the *second Satellite of* JUPITER.

Immersion.				Immersion.				Immersion.							
D.	H.	M.	S.	D.	H.	M.	S.	D.	H.	M.	S.				
JUNE.				10	2	31	16	27	7	22	45				
				13	12	51	4	30	20	40	40				
3	13	54	52	17	5	9	7	NOVEMBER.							
3	7	11	31	20	18	28	1								
10	16	30	0	24	7	46	58								
14	5	46	11	27	21	6	4								
17	19	4	27	31	10	25	6								
21	8	20	52	SEPTEMBER.				3	9	58	16				
24	21	38	16					6	23	15	13				
28	10	55	39					10	12	32	37				
JULY. -				3	23	44	10	14	1	49	26				
				7	13	03	9	Emersion.							
				11	2	22	11								
				14	05	41	10								
2	0	14	1	18	15	42	15					17	17	42	51
5	13	30	24	21	18	19	5	21	6	59	44				
9	3	48	55	25	7	37	55	24	20	17	2				
12	16	5	36	28	20	56	36	28	9	33	14				
16	5	23	15	OCTOBER.				DECEMBER.							
19	8	41	2												
23	7	59	5												
26	21	17	9												
30	10	35	19												
AUGUST.															
2	23	54	11	2	10	15	24					1	22	49	58
6	13	12	21	5	23	33	56					5	12	06	40
				9	12	22	14					9	1	23	45
				13	2	10	43	12	14	40	6				
				16	16	38	56	16	3	56	48				
				20	4	37	1	19	17	13	40				
				23	18	4	56	23	6	30	28				
								26	19	47	10				
								30	9	4	19				

JANUARY.

ECLIPSES of the third Satellite of JUPITER.

D. H. M. S.

D. H. M. S.

JANUARY.

4	5	16	46	I
4	7	27	2	E
11	9	16	59	I
11	11	27	11	E
18	13	17	29	I
18	15	27	37	E
25	17	28	42	I
25	19	28	46	E

FEBRUARY.

1	21	20	41	I
1	23	30	41	E
9	1	23	10	I
9	3	33	14	E
16	5	26	12	I
16	7	36	20	E
23	11	40	53	E

MARCH.

2	15	43	17	E
9	19	47	23	E
16	23	50	57	E
24	3	54	24	E

MAY.

20	9	57	33	I
27	13	56	47	I
27	16	10	44	E

JUNE.

3	17	55	27	I
3	20	10	11	E
10	21	54	12	I
11	0	9	22	E
18	1	52	44	I
18	4	8	20	E

JUNE.

25	5	51	28	I
25	8	7	32	E

JULY.

2	9	50	44	I
2	12	6	54	E
9	13	50	19	I
9	16	6	37	E
16	17	50	21	I
16	20	6	49	E

ECLIPSES of the third Satellite of JUPITER.

D.	H.	M.	S.		D.	H.	M.	S.	
23	21	51	53	I	OCTOBER.				
24	0	7	29	E	3	14	7	14	I
31	1	51	54	I	10	18	8	15	I
31	4	8	34	E	17	22	10	53	I
AUGUST.					25	2	8	48	I
7	5	52	22	I	NOVEMBER.				
7	8	11	10	E	1	6	8	38	I
14	9	53	49	I	8	10	7	13	I
21	13	55	38	I	15	14	5	21	I
28	17	57	44	I	22	20	33	42	E
SEPTEMBER.					30	0	31	35	E
4	21	59	54	I	DECEMBER.				
12	2	1	58	I	7	4	29	26	E
19	6	3	58	I	14	8	27	20	E
26	10	5	18	I	21	12	25	19	E
					28	16	22	24	E

Now, inasmuch as, in the Beginning of this Year, the Latitude of the fourth Satellite is greater than the Breadth of the Shadow of *Jupiter*, the Satellite will pass wide of it, and there will be no Eclipse of it till the Middle of *June* in the Year 1752.

It

It is to be observed, that, for about a Month before, and a Month after the Conjunction of *Jupiter* with the Sun, by reason of the Proximity of *Jupiter* to the Sun, the Eclipses cannot be observed. And this is the Reason that no Notice has been taken of them in the Catalogue between the 25th of *March* and the 24th of *May* following.

The Times here set down are according to the astronomical Way of reckoning, which supposes the Day to commence at the Noon of each Day, or when the Sun is upon the Meridian; and counting the Time on in a successive Order, without the Distinction of Morning and Afternoon, til the Sun returns to the Meridian again the next Day at Noon. Thus, for Example, in the preceding Catalogue, the first Emerision of the second Satellite is said to happen on *January* 1. at 20 Hours 6 Minutes; that is, according to the Civil Way of reckoning, on *Jan.* 2. at 6 Minutes after 8 in the Morning.

XVIII. *A Letter from the Widow of the late Mr. John Senex, F. R. S. to Martin Folkes, Esq; President of the Royal Society, concerning the large Globes prepared by her late Husband, and now sold by herself, at her House over-against St. Dunstan's Church in Fleet-street.*

S I R,

Read Jan. 19. 1748-9. **T**HE Royal Society being lately acquainted with some Improvements that were said to have been made upon the Globes at *Nuremberg*, and desired to encourage and recommend the same, I am obliged to return you my most grateful Acknowledgments for your kind Interposition in behalf of mine. It is sufficiently known, that Works of Art, made in our own Country, have, for the most part, a Degree of Exactness much superior to those of foreign Countries: And I hope I may be allowed to say in particular, and without Disparagement to the Performances of others, that my Globes will be found, upon Examination, as truly made, as accurate, and as well adapted for the Purposes of Geography and Astronomy, as any now extant. For (not to mention that the *Terrestrial* is formed from the best Maps that could be made or procured, and contains no material Error in the Situation of any Places where Observations have been really and truly made) the *Celestial*, upon the nicest Examination, will be found to have this Advantage above all others, that the Figures of the *Constellations* there given, were originally delineated by a Gentleman, whose Skill in Performances of this Nature was very well known and allowed; under the Direction of the great Dr. *Halley*, to whose Kindness my late Husband was upon all Occasions particularly indebted.

debted. And besides this, to each Star are added *Bayer's* Letters of Reference; a Circumstance extremely useful, either for the tracing out the Path of a Comet, or for describing any new *Phænomenon* in the Heavens.

It may be further observed, that Celestial Globes, as they are commonly fitted up, are adjusted only to one particular Year; though indeed they may serve without any sensible Error, during the Life of any single Person; whereas mine, particularly the two greatest, *viz.* of 17 and 28 Inches in Diameter, have this further Advantage, that they serve indifferently for any Age past or to come. For by means of a Nut and Screw, which will be hereafter described, the Globe is made to turn round an Iron Axle; whereby the Pole of the Equator (though fixed in common Globes) is made here to revolve about the Pole of the Ecliptic, and represents the slow Motion *forwards* observed among the fixed Stars, but really owing to the slow Motion *backwards* of the Equinoctial Points.

Upon this Account it is, that the Constellation of *Aries* is got into the Sign of *Taurus*, and the Constellation of *Taurus* into that of *Gemini*, and so of the rest. Hence likewise it is, that Stars which rose or set at particular Seasons of the Year in the times of *Hesiod*, *Eudoxus*, *Virgil*, *Pliny*, &c. by no Means answer at this Time to their Descriptions; but by the Improvement I am here speaking of, my Globes (allowing for the *Precession of the Equinox*, as it is called, *i. e.* one Degree in seventy-two Years) may, without any Trouble, be adjusted to the Accounts given by any of those Writers.

By this means likewise, every one may judge of the Truth of ancient Observations without the Labour of a tedious *Calculus*, which some are not able, and others are not willing, or at Leisure, to go through. By this means likewise, some Passages in those ancient Writers may be corrected, when Manuscripts afford no Assistance. For these frequently suffer by the Hands they go through, whilst the Heavens remain invariably the same.

As

As by this apparent Motion in the Heavens, not only the *Longitudes, Declinations, and Right Ascensions* of the fixed Stars are affected, but the Position of the *Colures* is of Course altered, yet by the Help of this Contrivance all may be restored, and the Age of an Author, in some sort, be ascertain'd.

The famous Astronomical Argument likewise of Sir *Isaac Newton*, in his *Chronology*, p. 86, 87, &c. may hereby be more particularly enquired into, and considered; all which Uses will be speedily shewn and demonstrated by a regular Series of Propositions, in a Treatise, as I am well assured, that is preparing for the Press, by the Reverend and Learned Mr. *George Costard*, Fellow of *Wadham-College*, in *Oxford*.

These, Sir, are some of the great Advantages of my Globes over others; and I therefore hope they will merit the Encouragement of a Society founded for promoting real and useful Learning; and that the Importation of any Globes from abroad may be rendered less necessary, if not entirely useless. I am,

With all Gratitude and Respect,

S I R,

London, Jan. 17.
1748-9.

Your most obliged,

Humble Servant,

MARY SENEX.

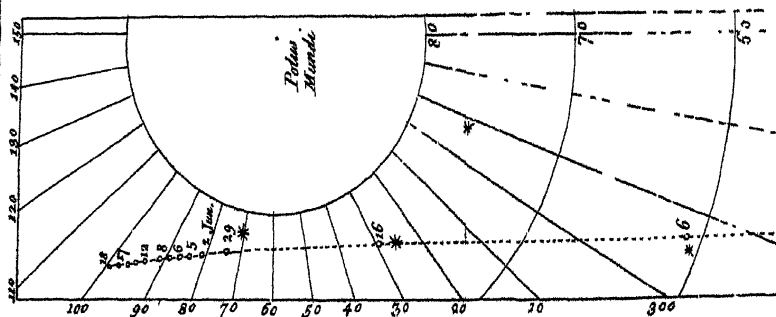
ERRATA.

No. 492. In the Contents Art. XIV. and p. 162. Art. XIV. for Mr. Richard Mason read Charles Mason, D. D.

No. 493. p. 213. l. 1. for ou read on.

FLORAE TI-PLANTIVS- MAG. I V · S · L ·

EX REGIIS
CHRISTINÆ THESAURIS



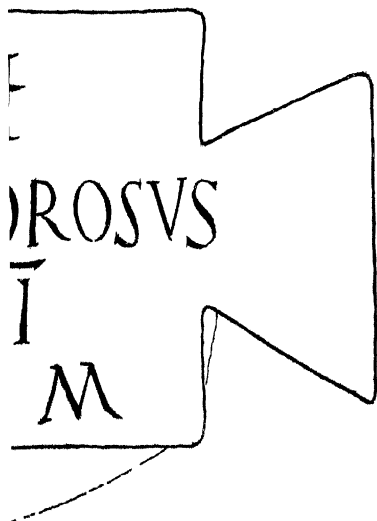


Fig. 3. p. 311.

θ^*
Camelopardali

α^*

β^*

γ^*

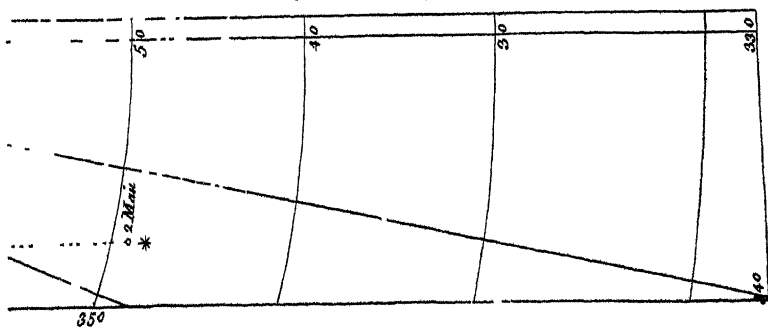
δ^*

ϵ^*

ζ^*

δ Cometa

Fig. 2. p. 307.



PHILOSOPHICAL TRANSACTIONS.

For the Months of *January, February, March,* and
Part of *April, 1750.*

- I. *Remarks upon an antient Roman Inscription, found in that Part of Italy, which formerly belonged to the Sabines; and now in the Possession of Richard Rawlinson, LL.D. & F.R.S. By Mr. John Ward, Prof. Rhet. Gresh. & F.R.S. p. 293.*
- II. *Epistola a Rev. Patre P. Augustino Hallerstein, S. J. M. Collegii Astronomici Pekinensis Præfide, ad Cromwell Mortimer, M. D. Secret. R. S. missa, unâ cum Observationibus Cometæ visi Pekini 1748. Novæ Constellationis; Occultationis Martis et Lunæ Dec. 6. 1747. Conjunctionis Martis et Veneris mense Martio 1748. & Congressus Jovis & Veneris Jan. 1. 1748. ibidem quoque factis. p. 305.*
- III. *Observatio Cometæ, Anno 1748. cum aliis aliquot Observationibus astronomicis a Rev. P. P. Antonio Gaubil e Soc. Jesu ad eundem transmissa; in Residentia PP. Gallor. Soc. Jesu Pekini. p. 316.*
- IV. *An Account of an Aurora Australis, seen Jan. 23. 1749-50. at Chelsea, by John Martyn, F.R.S. Prof. Bot. Cantab. communicated by Martin Folkes, Esq; Præs. Reg. Soc. p. 319.*

The CONTENTS.

- V. *A Letter from Mr. Christopher Maire to the President, containing Observations made at Rome of the Eclipse of the Moon, Dec. 23, 1749; and of that of the Sun, Jan. 8. 1750.* p. 321.
- VI. *Some Observations on the Dragon-Fly or Libella of Pensylvania, collected from Mr. John Bartram's Letters, communicated by Peter Collinson, F. R. S.* p. 323.
- VII. *Alberti Halleri Archiatri & Consil. Aul. Reg. Medic. in Acad. Gottingens. Prof. & Reg. Soc. Lond. Sodal. Experimenta aliquæ ad Respirationem pertinentia.* p. 325.
- VIII. *A Letter from Father Anthony Gaubil, Jesuit, to Dr. Mortimer, Sec. R. S. containing some Account of the Knowledge of Geography among the Chinese, and of Paper-Money current there. Translated from the French by T. S. M. D. and F. R. S.* p. 327.
- IX. *A Catalogue of the Fifty Plants from Chelsea Garden, presented to the Royal Society by the worshipful Company of Apothecaries, for the Year 1747, pursuant to the Direction of Sir Hans Sloane, Bart. Med. Reg. & Soc. Reg. nuper Præf. by John Wilmer, M. D. Hort: Chelf. Præfect. et Prælect. Botan.* p. 331.
- X. *A Letter from the Rev. Henry Milcs, D. D. and F. R. S. to Mr. Henry Baker, F. R. S. concerning the green Mould on Fire Wood; with some Observations of Mr. Baker's upon the Minuteness of the Seeds of some Plants.* p. 334.
- XI. *An Observation of the Eclipse of the Sun on Jan. 8. 1750. N. S. taken at the Observatory at Berlin,*

The CONTENTS.

Berlin, by M. Griscow jun. and M. Kiës. *Translated from the French.* p. 339.

XII. Alberti Halleri, *Archiatri et Consil. Aul. Reg. in Acad. Gottingenf. Medicinæ Prof. necnon R. S. Lond. Sodalis, Observationes de Viis Seminis.* p. 340.

XIII. *A Letter from John Martyn, M. D. Prof. Botan. Cantab. & F. R. S. to the President, concerning an Aurora Borealis seen February 16. 1749-50.* p. 345.

XIV. *A Letter from the Rev. Henry Miles, D. D. and F. R. S. to Henry Baker, F. R. S. concerning an Aurora Borealis seen Jan. 23. 1750-51.* p. 346.

XV. *A Letter from Mr. William Watson, F. R. S. to the Royal Society, declaring that he as well as many others have not been able to make Odours pass thro' Glass by means of Electricity; and giving a particular Account of Professor Bose at Wittemberg his Experiment of Beatification, or causing a Glory to appear round a Man's Head by Electricity.* p. 348.

XVI. *Part of a Letter from Mr. Professor Euler to the Reverend Mr. Wettstein, Chaplain to his Royal Highness the Prince, concerning the Contraction of the Orbits of the Planets. Translated from the French by T. S. M. D. and F. R. S.* p. 356.

XVII. *A Catalogue of the fifty Plants from Chelsea Garden, presented to the Royal Society, by the worshipful Company of Apothecaries for the Year 1748, pursuant to the Direction of Sir Hans Sloane, Bart. Med. Reg. et Societat. Reg. nuper Præs.*

The CONTENTS.

- Præf. by John Wiltner, M. D. Clariff. Societat.
Pharmaceut. Lond. Soc. Hort. Chelfean. Præfekt.
et Prælect. Botan. p. 359.
- XVIII. *An Account of a surprising Inundation in
the Valley of St John's near Kefwick in Cumber-
land, on the 22^d Day of Auguft 1749, in a
Letter from a young Clergyman to his Friend;
communicated by John Lock, Esq; F. R. S. p. 362.*
- XIX. *An Account of an extraordinary Fire-ball
burfting at Sea, communicated by Mr. Chalmers.
p. 366.*
- XX. *Extract of a Letter from the Abbé Noller,
F. R. S. &c. to Charles Duke of Richmond,
E. R. S. accompanying an Examination of certain
Phænomena in Electricity, publifhed in Italy; by
the fame, and translated from the French by Mr.
Watfon, F. R. S. p. 368*
- XXI. *An extraordinary Cafe of a Fracture of the
Arm; communicated by Mr. John Freke, F. R. S.
Surgeon to St. Bartholomew's Hofpital. p. 397.*
- XXII. *A farther Account of the Libelle or May-
Flies from Mr. John Bottom of Pennsylvania; com-
municated by Mr. Peter Collinfon, F. R. S. p. 400.*

- I. *Remarques sur une ancienne Inscription, trouvée en Italie, laquelle
 formerly belonged to the Sabines; and now
 in the possession of Richard Rawlinson,
 LL. D. & F. R. S. By Mr. John Ward,
 Prof. Rhetor. Gresh. & F. R. S.*

Read Jan. 11. 1749 50. **T**HIS inscription is cut in a small
 brass plate, which together with a
 draught of the same dimensions accompany this
 paper. See TAB. I. *Fig. 1.* The words of the inscrip-
 tion, as they stand on the plate, with some account
 how and where it was found, were formerly publish'd
 by *Fabretti*^a. But as what he says is very short, I shall
 take leave to transcribe the whole of it, which is as
 follows.

FLORAE
 TI PLAVTIVS DROSVS
 MAG II
 V. S. L. M.

Minucius Felix^b, *Lactantiusque*^c, *Floram inter
 propudiosa gentilitatis numina collocant. Vindicat
 autem hanc infamiam Ouzelius ad Minucium, pag.
 233, ubi ex Varrone et Ennio probat Romulo anti-*

^a *Inscript. Antiq. Cap. x. pag. 742.*

^b *Pag. 28. edit. Oxon. quarto.*

^c *Lib. i. cap. 20.*

quiorem fuisse Florae cultum, et flamines ei datos. Vestigium igitur hic remanet in Sabinis primum Floram coli coeptam; cum e Sabino agro in lamella aenea inscriptio haec nuper eruta fuerit apud Licentiam, Ursinorum oppidum, quod Digentia rivo alluitur. Licentia quippe a Digentia detortum nomen facile quis credet.

The plate now before us, and the inscription upon it, so exactly agree with this account of *Fabretti*, as to leave no doubt of their being the same with those described by him. The present possessor of the plate purchased it at Rome, in January 1720. N. S. At which time a small brass label was fixed to it, containing the following words cut in capital letters, EX REGIIS CHRISTINÆ THESAURIS; which is also here exhibited, with a draught of the same form and size subjoined to that of the inscription. It is probable therefore, that this plate might have been deposited among the other curiosities of that princess, soon after it was dug up; and afterwards have fallen into other hands, who affixed that label to it; till at length being exposed to sale, it was bought by the Doctor at the time above mentioned. For Queen *Christina* died at Rome, April the 19, 1689, where she had resided from the year 1658, after her return thither from France^d. The year following a catalogue of her Greek and Latin medals was printed at Rome^e, and *Fabretti* pu-

^a *Moreri, Diction. Histor.*

^e *Nummi antiqui in thesauro Christianae reginae Suecorum, Romae aſſervati, a Francisco Camelo, ejusdem Majestatis antiquario. Romae 1690.*

blished his large and elaborate collection of *Antient inscriptions* there in 1702. In which he says, that this plate, at the time he wrote his account of it, *nuper eruta fuerit*. But as he wrote this very probably some years before the publication of his book, the plate might have been found before the death of that princess, and been in her possession; and after her decease come into such hands, as might occasion the disposal of it, at the time, and in the manner, here recited.

But I shall now proceed to consider the words of the inscription; which may, I presume, be read at length, with the proper supplements, in the following manner:

*Florae Tiberius Plautius Drosus, pagi magister
anni secundi, votum solvit libens merito.*

The goddess FLORA was thought by the *Romans* to preside over fields and trees, and therefore they addressed to her to favour them with prosperous and fruitful seasons. Hence *Varro* says: *Invoco Rubigum et Floram, quibus propitiis, neque rubigo frumenta atque arbores corrumpit, neque non tempestive florent. Itaque publicae Robigo feriae Robigalia, Florae ludi Floralia sunt instituti*^f. But it appears from other passages of that writer referred to by *Fabretti*, that she was first a Sabine deity, and introduced at Rome by king *Tatius* in the time of *Romulus*, many ages before the institution of the

^f *De R. R. Lib. i. cap. 1.*

Floralia. For that festival was not observed till the year of the city 513, when the expence of it was ordered to be paid out of the fines levied on those persons, who had converted the public lands to their own use, for feeding their cattle &c. The memory of which is yet preserved on a coin struck that year, having on one side the *Genius of Rome*: and on the other a *sheep*, as an emblem of the manner, by which that money was raised; with the legend M P O B L I C I V S M A L E O L V S, the name of one of the aediles, who had the care of the coinage^b. And the same year also he with his brother *Lucius Publicius*, the other aedile, erected a temple in honour of the goddess *Flora*, near to the great *circus*ⁱ. However the *Floralia* were not afterwards constantly observed, but only when the season was bad, and seemed to threaten a scarcity of provisions. But in the year 580^k, by a decree of the senate, they were ordered to be celebrated annually, upon the fourth of the kalends of May, and the three following days^l, which ended with the first of that month.

TI, the two first letters of the *praenomen* of the person mentioned in the inscription, are the usual abbreviation of *Tiberius*; as a single T is of *Titus*^m.

^a Ovid. *Fast.* Lib. v. v. 279.

^b See *Vaillant Fam. Rom. in Publicia, num. 1.*

ⁱ Tacit. *Annal.* Lib. ii. cap. 49.

^k See *Pighii Annales ad ann. 513, 580.*

^l Ovid. *Fast.* Lib. v. v. 327, 183.

^m *Valer. Prob. de nat. Roman.*

PLAUTIVS, which follows, denotes the *family name* and often occurs in Roman writers as also upon coins, where it is sometimes written *Plo-*
rius, and at other times *Platius* ^a.

DROSVS, the *cognomen*, I do not remember to have seen so spelt elsewhere; but I make no doubt of its being the same as *Drusus*, which we frequently meet with. For thus, as was just now observed, his family name is written three several ways, *Plautus*, *Plotius* and *Plutius*. And Suetonius, speaking of the *Claudian* family, says: *Notissimum est Claudios omnes, excepto P. Clodio, optimates assertoresque dignitatis ac potentiae patriciorum semper fuisse* ^o. So likewise *Poblicius*, the name of the aedile above mentioned, is sometimes spelt *Publicus*. These instances indeed all relate to the family name; but the same is true likewise with regard to the *cognomen*. So the name *Poblicola*, first given to *Publius Valerius*, the colleague of *Bru-*
tus, but retained afterwards by the family, is generally written *Publicola* ^p. And as to *Drusus*, Suetonius acquaints us with the original of that name. *Drusus*, says he, *hostium duce Drauso cominus truncato, sibi posterisque suis cognomen invenit* ^q. His other names were *Marcus Livius*, and the action here referred to was in the year of the city 470 ^r.

^a See *Vaillant Fam. Roman. in Plautia*.

^o In *Tiber. cap. 2*

^p *Liv. li. 8. vii 32.*

^q In *Tiber. cap 3*

^r See *Figini annales, ad an. 470, 471.*

It therefore seems very probable, that this *cognomen* being so antient, might by some of the descendents of that family be writen *Drosus*, and afterwards more generally *Drusus*. For as the Romans endeavoured gradually to improve their language, and soften its pronunciation, they changed *au* into *o*, and again *o* into *u*, for the more agreeable sound. This appears not only from the examples given already, but likewise from many others, which might be produced, as well of common words as proper names. Of the former sort are *codex* from *caudex*, *corus* from *caurus*, *lotus* from *lautus*, and *fox* from *saurex*; and of the latter, *multus* from *moltus*, *rubigo* from *robigo*, *vulgus* from *volgus*, *Vulcanus* from *Volcanus*, and the like.

MAG. II. according to the explication given above, are an abbreviation of the words *magister secundi*, which stand for *pagi magister anni secundi*, was the whole to be expressed at length. The word *pagus* signifies a division or large portion of land, not much unlike what we call a *shire* or *county*. Hence *Caesar* in his history of the *Gallic war* says: *Omnis civitas Helvetia in quatuor pagos divisa est*^s. And again speaking of the *Suevi*, who were a very large nation: *Hi centum pagos habere dicuntur*^t; tho' *pagus* is sometimes used by the poets in a more restrained sense, for a single *village*. So *Mandela* is described by *Horace*, as *rugosus frigore pagus*^v. And *Virgil* represents the rural sports, as

^s Lib. i. cap. 12.

^t Lib. iv. cap. 1.

^v *Epist.* Lib. i. xviii. 103.

performed *pagos et compita circum*^x. As to the title *magister*, it always denotes some preeminence and authority, and is used in a variety of senses, as *master* is with us. So *Festus* sais: *Magistri non solum doctores artium; sed etiam pagorum, societatum, vicorum, collegiorum, equitum dicuntur; quia omnes hi magis ceteris possunt* y. Of these the *magister pagi* was a very antient officer among the Romans, appointed by *Numa Pompilius*, the immediate successor of *Romulus*, as we learn from *Dionysius* of *Halicarnassus*. “For *Numa* (as he “sais) first divided the whole country into such “portions, as they call *πάγες*; over each of which “he appointed an officer, whom he calls *ἀρχοντα*, “*ἐπίσκοπον*, and *περίπολον*, that is, a president or “*master*, inspector, and surveyor. His business was “to survey the lands, and take an account in writing, whether they were well or ill cultivated; “which accounts he laid before the king: who “commended those husbandmen, who had been “diligent, and treated them courteously; but reproved and fined the indolent, in order to excite “them to greater diligence z.” The Roman territories at that time were confined within very narrow bounds; but in after ages, as they enlarged their dominions by conquests, many of the countries, which they subdued, were given to the soldiers, as a reward for their service. And as a certain quantity of land was allotted to each soldier, the distribution was made by persons sent with them for that purpose; and those settlements, or colo-

^x *Georg. Lib. ii. 382.*

^y *In voc. Magisterare.*

^z *Aniq. Rom. Lib. ii. cap. 76.*

nies, were divided into several *pagi*, or *pagi*, which were considered as distinct communities. And because differences would sometimes happen among them afterwards about the limits of their possessions, the *magistri pagorum* were empowered to adjust them, and prevent all encroachments on that sort. For which end also public processions were made at certain times, accompanied with sacrifices and other religious ceremonies, in honour of the tutelar deity of the place, the expense of which was born by contributions of the inhabitants; as was shewn in a former paper, which I had the honour to lay before this Society ^b. These officers had likewise the care of the roads, which led from one town or village to another, within their respective jurisdictions, to keep them in good repair ^c. And another part of their duty was to provide accommodations for the armies in their march, as also for the governors of provinces, and other great persons, in passing thro' their several districts upon public affairs ^d. Horace seems to refer to this, when he says:

*Flaccus, optimus atque
Cognatus; missi magnis de rebus uterque
adversos soliti componere amicos.*

And soon after:

*Proxima Campano ponti quæ villula tectum
Præbuit; et parochi, quæ debent, ligna saleque ^e.*

^a *Siculus Flaccus*, pag. 9, 25, edit. Gosh.

^b See *Philos. Transact.* num. 486.

^c *Siculus Flaccus* ubi supra. *Eraz. Magon. et Vrc.* pag. 255.

^d *Sic. Flac.* pag. 25.

^e *Serm. Lib. i. Eolog.* v. v. 27, 45.

Where by *parochoi* (so named from *παρέχειν* to provide) may be meant an inferior sort of officers, appointed by the *master* to provide all necessities for strangers, included here in the words *ligna salemque* &c.

But as the title *magister* was common to so many officers of different characters, it may be expected, that some reason should be alleged for assigning it to the *magister pagi* in this inscription, where no other word is added to determine the particular sense of it. And indeed I cannot pretend to offer any direct proof for this; but the reasons, which induce me to think so, are these which follow. Both the design and form of the inscription seem to suit him best. For the purport of it being the performance of a vow to the goddess *Flora*, very probably for a prosperous and fruitful season, as the effect of their addresses to her; by whom could that so properly be done, as by this officer, who presided over the religious as well as civil affairs of the inhabitants? Besides, I cannot but think from the name *Drosus*, which elsewhere is always spelt *Drusus*, that this inscription was written before several other officers were appointed, who afterwards bore the title of *magister*; which might render any explanatory word unnecessary at that time, especially in the place where he had his residence. There are indeed two inscriptions published, one by *Gruter*, and the other by *Rinesius*^a,

^a See *Bodaci Abant.* in *Pandett.* p. 262.

^b *Pag.* xxvi. num. 9.

^c *Clas. Hist. num.* LXXI.

in which the word PAGI is added to MAGISTER; in the same manner as we meet with *magister collegii, vici*, and the like. But the former of these was as late as the reign of *Tiberius*; and the time of the latter uncertain, so that nothing can be concluded from it. And there are likewise several inscriptions, in which MAGISTER and MAGISTRI stand alone, without the addition of any explanatory word. But then it appears either from the design of those inscriptions, the number of persons mentioned, or some other circumstance relating to them, that their office was of a different nature; some few instances of which I shall presently have occasion to mention. From these considerations therefore I have been led to conclude, that the sense here assigned to the word *magister*, as it respects this inscription, is the most probable.

That the characters $\bar{\text{II}}$ stand for *anni secundi*, the date of the time, during which this *Drosus* had then held that office, is confirmed by several inscriptions published by *Gruter*. In one of which we have MAG. ANNI. $\bar{\text{V}}$ ⁱ; in another MAGISTRI. ANNI. $\bar{\text{VI}}$ ^k; and in two others MAG. ANNI. PRIMI ^l, where the word denoting the time is expressed at length. As these different ways therefore of expressing the time relate to persons, who all bore that title, tho not the same office,

ⁱ Pag. LIV. num. 1.

^k Pag. XXXVI. num. 7.

^l Pag. XXXIII. num. 10. XXXV. 5.

as appears by the inscriptions; they plainly shew in what sense those characters are to be taken here.

The concluding letters V. S. L. M. which stand for *votum solvit libens merito*, contain the usual form of dedicating votive monuments.

But the thing dedicated is not mentioned here, which was most probably a statue or an altar; and I rather think the latter, from the number of such inscriptions in *Gruter*, and other collectors of ancient monuments, taken from altars. Whereas we hear of few images of any sort relating to this deity. *Pliny* indeed mentions a statue of *Flora* at *Rome*, which was made by *Praxiteles* ^m. And *Montfaucon* has given the draughts of three or four others, which have been thought to represent that goddessⁿ. Her head also is found upon two coins, one of the *Claudian*^o, and the other of the *Servilian* family ^p. However these are but very few, comparatively with what we meet with of other deities. Besides, the age of this inscription (which seems further confirmed by its brevity and simplicity) as likewise the place where it was discovered; suit much better with an altar; for altars were erected in all parts of the country, and very early. I suppose therefore, that this plate was fixed into the front of some altar consecrated to *Flora*; for which purpose both

^m *Nat. Hist. Lib. xxxvi. cap. v. §. 5.*

ⁿ *L. Antiq. expliq. Tom. i. par. 2. chap. 30.*

^o See *Vaillant Fam. Rom. num. 13.*

^p *Ibid. num. 17.*

the shape of it, and the angles at each end, seem to be very well adapted. The town, where it was dug up, is by *Fabretti* called *Licentia*; which he supposes to have taken its name from the river *Digentia*, that runs by it. *Horace's* farm therefore was probably not very far from thence, since he speaks of it as near that river, when he says:

*Me quotiens reficit gelidus Digentia rivus;
Quem Mandela bibit, rugosus frigore pagus:
Quid sentire putas, quid credis, amice, precari?*

The antiquity of this inscription, together with its singularity, made me think it not unworthy the notice of this learned Society. For tho we meet with two inscriptions, one in *Gruter*,^r and the other in *Rinesius*,^s to the honour of *Flora* jointly with other deities; yet this is the only one I can find, which is addressed to her alone. And as to the manner of explaining the several parts of it, that is left to every one to judge of, as he pleases.

G. C.

Decemb. 20, 1749.

JOHN WARD.

^r *Epist. Lib. i. XVIII. 103.*

^s *Pag. CXXI. num. I.*

^t *Class. prim. num. CCXXXIII.*

II. *Epistola a Rev. Patre P. Augustino Hal-
lerstein, S. J. M. Collegii Astronomici
Pekinenfis Præfide, ad Cromwell Morti-
mer, M. D. Secret. R. S. missa, una cum
Observationibus Cometæ visi Pekini 1748.
Novæ Constellationis Occultationis Martis
et Lunæ Dec. 6. 1747. Conjunctionis Mar-
tis & Veneris mense Martio 1748. & Con-
gressus Jovis & Veneris Jan. 1. 1748.
ibidem quoque factis.*

Clarissimo Viro Domino CROMWELLO MORTIMER

S. P. D.

Collegii Pekinenfis PATRES Societatis Jesu.

*Read January
18. 1749.*

HUMANISSIMAS tuas, vir clarissime,
quas Nonis Februarii 1746 ad nos
dedisti Collegii Pekinenfis Socios, sub initium No-
vembris hujus anni 1748. cum magna voluptate ac-
cepimus. Neque enim non poteramus nobis maxi-
mopere gratulari honorem, quo nos clarissima Socie-
tas vestra dignata est, observationes nostras astrono-
micas qualescunque æqui bonique consulendo, atque
etiam continuationem commercii literarii a nobis ef-
flagitando.

Fuerunt illæ Observationes factæ a decessoribus hic
nostris PP. Ignatio Kögler, et Andrea Percyra, qui
cum

cum ambo ad meliorem vitam abierunt, successimus illis Ego, et P. Antonius Gogest, qui non deerimus pro modulo nostro æquissimæ postulationi vestræ respondere. Et quas quidem impræsentiarum promptas habebamus observatiunculas nostras hujus anni, ante dies bene multos tradidi Patri Antonio Gaubil easdem a me efflagitanti, ut eas ad suos in Galliam transmittere posset; acceptis autem humanissimis tuis, vir clarissime, cum eas nondum expeditisset, exposcenti mihi recepit se eas recta ad te missurum una cum hac Epistola nostra.

Vobis certe, Viri clarissimi, atque inclytæ Societati vestræ, plurimum obstricta est Astronomia hic nostra, ut quibus maximo adjumento sunt, doctissimæ lucubrationes clarissimorum virorum vestralium Newtoni, Gregorii, Flamstedii, aliorumque. Justum igitur et æquum nobis visum tibi, vir clarissime, tuorumque desideriis morem gerere, dum vos, viri clarissimi, pergatis nos lucubrationibus vestris erudire, et favoribus prosequi.

Atque cum impræsentiarum nobis pluribus non liceat, prolixiores anno venturo daturos nos pollicemur. Valete.

Dabam Pekini, in Collegio Societ. Jesu.
VI. Iduum Novembris 1748.

AUGUSTINUS HALLERSTEIN, S.J.M.
Collegii Astronomici Præses.

Via, & Ephemeris Cometæ visi Pekini Sinarum,
1748.

Visus nobis isthic hoc anno Cometa, sane quam tristis et infelix, præterquam enim quod lumine luceret admodum obscuro et maligno, via incessit tam deserta, [*vid. TAB. I. Fig. 2.*] cœlo tam parum favente, ut non nisi raro, cum paucis aliquot stellulis, nec istis scio, quam suo loco positis comparari potuerit.

Die 26 April. mane sub horam tertiam primum visus est illis, qui ex officio in specula astronomica hujus regiæ excubant; notaturque illius locus armilla zodiacali rudiuscule scilicet in 18° ♄ cum Lat. bor. 27° nempe in pectore Pegasi sub stellis λ et μ , caput æqualis stellæ tertii ordinis, cauda longa quasi uno gradu.

Sequentibus diebus nulla diligentia obtineri potuit, ut cum aliqua fixa accuratius compararetur; itaque crassiuscule solum determinata illius aliqua loca per configurationes cum circumvicinis stellis, quæ ut calculi rigorem non ferant, viam saltem quam Cometa teneret, indigitarent; nimirum,

Die 27 Aprilis mane circa 2^h Long. ♄ $21^{\circ} 20'$ cum Lat. bor. $31^{\circ} 35'$.

Die 28 Aprilis man. sub idem tempus ♄ $25^{\circ} 15'$ cum Lat. bor. $36^{\circ} 0'$.

Die 29 Aprilis man. sub idem tempus ♄ $29^{\circ} 10'$ cum Lat. bor. $40^{\circ} 0'$.

Die 30 April. & 1 Maii, per nubes nihil visum.

Die 2 Maii mane comparari demum potuit Cometa cum stellula lucidiuscula media inter 5 stellulas, quæ sunt in flexu catenæ Andromedæ, notaturque

que ope micrometri & penduli $2^h 31' 49''$ t. v. Cometa orientalis stella $1' 50''$ penduli, eademque borealis $57' 8''$.

Die 6 Maii mane comparatus Cometa cum stellula quæ in Cat. Britannico Flamst. ponitur in constellatione Cassiopeæ ordine sexta, per differentias declinationum et distantias, eo quod ob cælum non satis sudum, tardum motum, et malignum lumen Cometæ transitus ejusdem per horarium etiam inter plura secunda penduli definiri non posset; nimirum $2^h 3' 57''$ t. v. erat Cometa borealis stella $44' 8''$, captaque illico distantia erat $50' 50''$.

Sequentibus diebus comparatus Cometa cum variis stellulis, sed ignotis; unde nihil de illius loco statui potuit.

Die 15 Maii vespere circa nonam (momentum enim temporis per oblivionem notatum non est) visus Cometa inter duas stellulas, a quarum propiore distabat in austrum (situ recto, non inverso) $11' 3''$ et a remotiore in boream $59' 58''$. Videbatur etiam Cometa orientalis propiore $1'$ penduli. Hæ duæ stellulæ ponuntur in Cat. Brit. Flamst. in constellatione Cassiopeæ sub finem borealis quidem, eaque propior in $\Pi 4^\circ 49' 7''$ cum lat. bor. $58^\circ 6' 56''$, australior autem eademque remotior in $\Pi 3^\circ 28' 12''$ cum lat. bor. $57^\circ 11' 10''$, nempe ad annum illum 1690.

Die 16 Maii comparatus Cometa cum hesternarum borealiore, $11^h 1' 59''$ noctis erat orientalis stella $18' 26''$ penduli, eaque borealis $26' 4''$.

Die 19 Maii comparatus Cometa cum stella quæ in Catalogo fixarum J. Hevelii illo ad annum 1700 ponitur sextæ magnitudinis in Cephæo, vocaturque
sub

sub fascia sequens, eratque $10^h 23' 29''$ noctis Cometa in eadem ascensione recta cum stella : certe nunquam notari aliqua potuit temporis differentia inter utriusque transitum pro horarium ; erat autem Cometa borealior stella $48' 14''$.

Inde visus per sequentes dies nihil certi de loco Cometæ constitutum.

Die 29 Maii visus Cometa juxta complures stellulas, sed ignotas, scilicet moto paulum tubo apparuit, nempe quam Hevelius in Catalogo suo fixarum illo ad annum 1660 ponit in constellatione Camelopardali, vocatque *Supra tergum, sive in cuspide pedis sinistri Cephei* 5æ magnit. Cum autem hujus stellæ parallelus longius distaret a parallelo Cometæ, quam ut immediate cum illa comparari posset, comparatus est mediante stellula intermedia, notaturque Cometa $11^h 21' 25''$ noctis orientalis dicta stella $16' 13''$ penduli, eademque australior $1^o 37' 22''$.

Inde quia juxta viam Cometæ nullæ erant, neque futuræ videbantur stellæ cum quibus comparari posset, longiuscæ scilicet petendæ erant : itaque sequentibus diebus comparatus est cum γ Cephei, a cujus parallelo non multum aberat. Ergo telescopio probe firmato,

Die 1 Jun. vesp. $9^h 30' 53''$ γ Cephei ad horarium.

2 Jun. mane $3^h 24' 51''$ Cometa ad horarium borealior stella $26' 59''$

Die 4 Jun. vesp. $8^h 28' 58''$ γ Cephei ad horar.

5 Jun. mane $2^h 41' 9''$ Cometa ad hor. australior stella γ $8' 20''$.

Die 5 Jun. vesp. $8^h 23' 23''$ γ Cephei ad horar.

6 Jun. mane $2^h 41' 17''$ Cometa ad horar. australior stella $20' 12''$.

Die 7 Jun. vesp. $8^h 5' 3'' \gamma$ Cephei ad horar.

8 Jun. mane $2^h 32' 51''$ Cometa ad horar. australior stella $42' 51''$.

Die 8 Jun. vesp. $8^h 31' 59'' \gamma$ Cephei ad horar.

9 Jun. mane $3^h 4' 38''$ Cometa ad horar. australior stella $55' 34''$.

Die 12 Jun. vesp. cum jam vix spes esset videndi ultra cometæ, vidi illum tamen parvum jam obscurum, vestigium aliquod cometæ verius quam cometam. Adde clarorem Lunæ et nubiluginem ab eadem collustratam, quæ omnia difficilem, dubiam, et parum tutam faciunt observationem, præsertim accidente etiam lumine laternæ; nihilominus, ut potui, comparavi eundem cum stellula, quam postea reperi in una Mappula et Catalogo Dni. de la Caille in tomo Memor. Acad. Reg. Scient. Paris. 1742 anni occasione cometæ illius anni detectam, et notatam cum ascensione recta ad id tempus $91^\circ 21'$ et decl. bor. $73^\circ 49'$, signatamque litera *A*, itaque $9^h 33' 6'' A$ ad horar. tum $9^h 45' 23''$ Cometa ad hor. borealior stella $46' 34''$.

Die 13 Jun. vesp. $9^h 13' 11'' A$ ad horarium $9^h 29' 43''$ Cometa ad horarium borealior stella $36' 15''$.

Die 14 Jun. vesp. $9^h 15' 44'' A$ ad horarium $9^h 36' 4''$ Cometa ad hor. borealior stella $25' 47''$. Tum visa $9^h 55'$ dimensæ distantia Cometæ a stellis

I $25' 9''$

B $38' 39''$

R $43' 3''$

Stabat autem Cometa juxta stellam *Q* quæ stellæ omnes loco citato notatæ sunt.

Die 15 et 16 Junii per nubes observare nihil licuit.

Die

[311]

Die 17 et 18 me domo abeunte observavit P. Ant. Gaubil sic.

Die 17 Jun. vesp. $9^h 26' 30''$ *A* ad horarium.

$53 35$ *R* ad horarium.

$9^h 55' 15''$ Cometa ad hor. in cod parallelo cum *A*.

Die 18 Jun. vesp. $9^h 52' 14''$ *A* ad horarium.

$10 19 21$ *K* ad horarium.

$9^h 24' 50''$ Cometa ad hor. australior stella *A* $16' 30'$,
stella *R* $10 20$

Est autem stellæ *R* asc. recta $98^\circ 6\frac{1}{2}'$ et decl. bor. $73^\circ 43'$.

Tempora observationum omnia sunt vera, et satis correctæ.

Observationes porro factæ sunt tubo 6 pedum, cui insertum Micrometrum Anglicum.

Nova' Constellatio.

Ut ne pars hæc folii vacua' abiret, addam constellatiunculam quæ 29 Maii cometam tubo venantius occurrat; ea est, qualis in TAB. I. *Fig. 3.* apparet, quarum stellarum, distantia erant α a β $12' 19''$, β a γ $16' 45''$, γ a δ $10' 2''$, δ ab ϵ $16' 45''$, γ a ζ $19' 53''$, δ ab ζ $28' 17''$, γ a θ , quæ est ipsa Camelopardali *supra tergum* $58' 16''$; δ ab eadem $50' 3''$. Sed has ipsas distantias aliis accuratius dimetiendas relinquo. Est autem situs hujus asterismi rectus, non inversus.

*Occultatio Martis a Luna observata Pekini Sinarum
1747. mense Decembris die sexta vesp.*

A. ,

- 4 52 17 δ distabat a limbo lucido Lunæ 50' 4".
Tum δ observatus, et comparatus cum stel-
la γ sic :
- 5 3 9 δ ad horarium.
12 47 γ ad horarium borealior quam δ 41' 6"

9 38 Differentia temporaria.
- 5 18 26 δ ad horarium.
28 2 γ ad horarium borealior quam δ 41' 2"

9 36 Differentia temporaria.
- 5 34 34 δ ingressus sub limbum obscurum ϵ totus
disparuit, distans a cornu boreo ϵ 23' 28"
Illico dimensa diameter ϵ erat 32' 53"
Pars autem lucida ϵ erat 7' 39"
Interea dum δ post ϵ lateret, observata et
comparata ϵ cum stella θ γ sic :
- 5 58 9 θ ad horarium.
- 6 3 31 Limbus lucidus ϵ ad horarium.
4 23 Cornu boreum ϵ ad horarium.
58 Cornu austrinum ϵ ad horarium.
Eratque limbus austrinus ϵ australior stella
 θ 34' 27"
Iterum
- 6 11 36 θ ad horarium.
17 22 Limbus lucidus ϵ ad horarium.
18 12 Cornu boreum ϵ ad horarium.
46 Cornu austrinum ϵ ad horarium.
Erat autem limbus austrinus ϵ australior
stella θ 31' 0".

Tertio

2 1 " Tertio

6 23 22 θ ad horarium.

29 26 Limbus lucidus ϵ ad horarium.

30 17 Cornu boreum ϵ ad horarium.

52 Cornu austrinum ϵ ad horarium.

Erat autem limbus austrinus ϵ australior
stella θ 27' 48".

6 38 52 Erat quædam parvula stellula appropin-
quans limbo obscuro ϵ , cumque subin-
gressura distabat a limbo lucido ϵ 41'
23". Tum

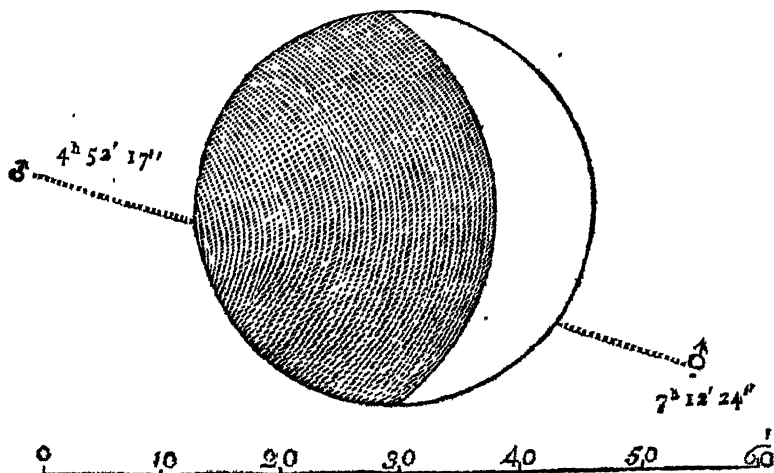
6 46 2 δ primo apparuit prodiens de sub ϵ , di-
stansque a cornu boreo ϵ 29' 24".

7 2 23 Supradicta parva stellula subingressa limbum
obscurum ϵ distans a cornu boreo ϵ to-
tidem 29' 24". Denique

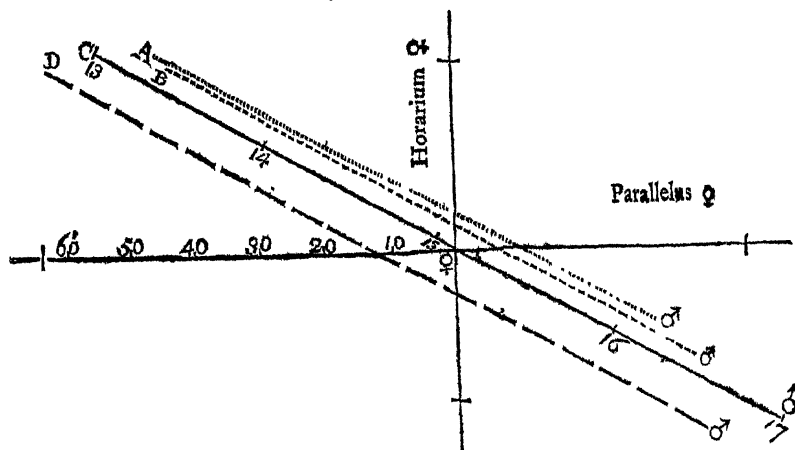
7 12 24 Distabat δ a limbo lucido ϵ 11' 30".

Temporum momenta sunt vera, et correctæ
per altitudines correspondentes.

Phases omnes observatæ tubo sex pedum,
cui insertum micrometrum Anglicum.



Conjunctio Martis et Veneris, observata Pekini Sinarum mense Martio Anno 1748.



A ♂, est via ♂ juxta ♀ ex Ephemeridibus Pekinenfibus.

B ♂, eadem via ex Ephemeridibus Parifenfibus De la Caille.

C ♂, eadem via ex Observationibus.

D ♂, eadem via ex Ephemeridibus Bononienfibus D. Manfredi.

Observationes porro fic habent :

	a	i	''		o	i	''
Martii die 12.	6	27	52	♂ orientali	♀	1	48 48
eaque borealior			53 46.				
Martii die 13.	6	25	43	♂ orientali	♀	0	56 8
eaque borealior			27 26.				
Martii die 14.	6	10	33	♂ orientali	♀	0	29 34
eaque borealior			14 36.				

Martii

Martii die 15.	6	28	4	♂	orientalior	♀	0	3	0
eaque borealior	1	30.							
Martii die 16.	6	27	13	♂	occidentalior	♀	0	23	48
eaque australior	10	41.							
Martii die 17.	6	25	14	♂	occidentalior	♀	0	50	38
eaque australior	23	24.							
Martii die 19.	6	29	52	♂	occidentalior	♀	1	44	47
eaque australior	48	14.							

Omnes hæ differentiæ determinatæ sunt ex repetitis operationibus, tubo 6 pedum cum micrometris. Tempora item vera, et correctæ per altitudines correspondentes.

Ut folium hoc impleatur, addenda visa

Observatio congressus Jovis cum Venere, Anno 1748, 1 Januarii vespere.

5^h 15' 41' distabat ♃ a ♀ 1° 3' 49". Tum
 5 22 14 ♃ ad horarium.
 25 6 ♀ ad horar. australior ♃ 50' 35"
 2 52

Iterum 5 26 36 ♃ ad horarium.
 29 32 ♀ ad horar. australior ♃ 50' 15"
 2 56

Tertio 5 30. 35 ♃ ad horarium.
 33 34 ♀ ad horar. australior ♃ 49' 37"
 2 59

III. *Observatio Cometæ, Anno 1748, cum aliis aliquot Observationibus astronomicis a Rev. P. P. Antonio Gaubil e Soc. Jesu ad eundem transmissa; in Residentia PP. Gallor. Soc. Jesu Pekini.*

DIE 27 April. mane $3^h 30'$ vidimus cometam in medio stellarum Pegasi β λ η .

2 Maii comparavimus etiam cometam cum stellis de quibus agit P. Hallerstein in Flamstedio 1690. Stella in γ $11^{\circ} 26' 45''$. Locus cometæ idem ferme concluditur seu ex nostra seu P. Hallerstein observatione.

3 Maii 3^h mane α et σ Cassiopeæ in linea recta cum cometa. σ est in medio sat præcisè.

4 Maii mane $4^h \frac{1}{4}$ cometa occidentalior 3^a stella in Cassiop. apud Flamstedium $5' 35''$, cometa australior $1^{\circ} 1'$.

5 Maii nihil exacte observari potuit.

6 Maii mane $2^h 51'$ linea per α et β Cassiopeæ paululum ad austrum cometæ, distantia β a stella κ = distantia β a cometa.

10 Maii vespere, $9^h 14'$ minima altit. cometæ vera $20^{\circ} 48' 58''$ cometa occidentalior orientali stella (componitur ex duabus) $27' 12''$; in Flamstedio stella in Tauro 25° et aliquot min.

15 Maii comparavimus etiam cometam cum stellis P. Hallerstein. Cometæ altit. merid. vera p. m. $25^{\circ} 51' 30''$ $10^h 12'$. Cometa australior stella $8'$; altit. mer. stellæ boreal. $25^{\circ} 59' 30''$. Non bene observavimus differentiam asc. rectæ.

16 Maii

16 Mai. p. m. vera altit. merid. cometæ $26^{\circ} 16'$
 $32''$; in reticulo $10^h 22'$: cometa orientaliior stella
 P. Hallerstein $1^{\circ} 41'$.

17 Maii p. m. $10^h 40'$ vera altid. minima cometæ
 $26^{\circ} 46' 34''$.

γ Cephæi ad horarium $7^h 54' 58''$.

Cometa ad horar. $10^h 41' 43''$.

Via cometæ videtur borealior via stellæ $38' 20''$.

In schedulis non reperio sat multas observationes
 factas usque ad 7 Jun. Sed ex comparatione cometæ
 cum Heveliana stella, de qua infra, et aliis non ita
 bene cognitis mihi, videor posse concludere, a die 2^{do}
 Jun. ad 7mum cometæ asc. rectam crevisse 6 grad.
 et minut. aliquor. declin. vero decrevisse $55'$.

7 Jun. mane $1^h 15'$ stella ad horarium $35' 30''$ post
 cometam. Stella borealior $1^{\circ} 30'$ sat. dubie obser. *

9 Jun. $0^h 45'$ cometa ad horarium.

$0^h 49' 10''$ stella ad horarium A. §

Cometa borealior $1^{\circ} 30'$.

Usque ad 12 Jun. nihil sat exacti fuit observatum.

13 Jun. p. m. $9^h 30'$ distantia cometæ a stella I ||
 $10' 20''$.

Cometa borealior $4' 25''$.

Cometa est orientaliior.

17 Jun. p. m. $0^h 26' 30''$ A ad horar. }
 $53 \quad 35$ R ad horar. } †
 $55 \quad 15$ cometa ad hor.

Cometa et R. in eadem declin.

* Hevelii stella ad ann. 1660. asc. recta $2^{\circ} 24' 39''$. Dist. a
 polo $12^{\circ} 42' 17''$.

§ Stella A in Fig. D de la Caille in Act. Paris. 1740.

|| Stella I in Fig. D de la Caille. Act. Paris. 1742.

† A. R. stellarum notæ in Fig. D de la Caille, Act. Acad. Paris.
 1742.

18 Jun. p. m. 9^h 52' 14" *A* ad horar.

10 19 21 *R* ad horar.

24 57 cometa ad horar.

Cometa australior *A* 16' 30"

australior *R* 10 20.

Diebus sequentibus tubo 7 ped. et amplius, cujus apertura = 1° 0' 24", observatus est cometa cum stella *D* in Fig. *B. La Caille* Act. Acad. Paris. 1742. Nul- lum fere successum habuere multæ ex illis observa- tionibus: refero tantum duas, quæ non mihi videntur omnino exactæ.

27 Jun. p. m. stella *D* intrat in tubum 9^h 23' 10"

exit ex tubo 9 36 0

cometa intrat 9 40 28

exit 9 52 16.

Cometa concluditur borealior 19' 40".

29 Jun. *D* intrat 11^h 1' 40" p. m.

exit 11 14 51

Cometa intrat 11 23 54

exit 11 36 0

Cometa concludit borealior 12' aut forte 13'.

Non facile videbatur cometa 29 Jun. fuere nubes diebus 30 Jun. 1 et 2 Julii; nec deinde quæsitus est cometa.

En, domine illustrissime, observationes aliquot cometæ.

Pekini, 8 Nov. 1748.

Ant. Gaubil, S. J.

Obj.

Obs. conjunctionis Martis cum Venere.

1748. t. v. 15 Mart. p. m. 8^h 10' limbus occident. ♂
distat a limbo occidentali ♀ 1' 29".

Obs. aliquot Eclips. Satell. Jovis.

13 Octob. p. m. tempore vero 9^h 40' 30" ima Em.
3ⁱ satell. ♄. tub. 15 ped.

15 Octob. p. m. tempore vero 8^h 37' 26" Emerf. 1ⁱ
satell. eod. tubo.

20 Octob. p. m. tempore vero 10^h 7' 56" Imm. total.
3ⁱ satell. eod. tub.

21 Octob. p. m. tempore vero 5^h 52' 12" Emerf. 2^{di}
satell. eod. tub. dubiè.

28 Octob. p. m. tempore vero 8^h 29' 20" ima Em.
2^{di} satell. eod. tubo.

7 Nov. p. m. tempore vero 8^h 52' 59" ima Emerf.
1ⁱ satell. eod. tubo.

IV. *An Account of an Aurora Australis, seen Jan. 23. 1749-50; at Chelsea, by John Martyn, F. R. S. Prof. Bot. Cantab. communicated by Martin Folkes, Esq; Præf. Reg. Soc.*

Read Jan. 25. 1749-50. **J**AN. 23. 1749⁵⁰ at about half an Hour after five in the Evening, casting my Eye accidentally toward a Window which looked to the S. S. W. I thought I saw a reddish Light about the Planet *Venus*, which then shone exceedingly bright. Being suspicious of some Fire in the Neighbourhood, I went immediately to a Window on the

Stair-case, where I saw a reddish Light, which shone with such exceeding Brightness, that the Lustre of the fine Constellation of *Orion* was almost effaced. I then went to a Window facing the N. N. E. where I presently saw a very broad Band of Crimson Light, like that which I observed from the same Window, *March* 18. 1738-9; an Account of which is printed in the *Phil. Transf.* No 461. But in the former the red Band was bounded on the N. by Streams of a greenish Blue; whereas the Band now observed was entirely of a deep Crimson Colour, being of a much darker Red than the former.

Thence I withdrew into my Garden, where I plainly saw a Band or Arch, of a very deep Crimson Colour, in Appearance about 15° broad, the Southern Edge of which passed just above *Canis minor*, and the Shoulders of *Orion*. It was terminated to the Westward, near *Venus*, then about 20° high: but it extended to the Eastward as far as I could see, and the farther it went that way, the deeper was the Colour, and the broader the Band. About a Quarter before Eight, there was formed a Crown about 30 Degrees to the Southward of the Zenith; for I could plainly perceive the *Pleiades*, which had then just passed the Meridian, very near it, when the Light was faint. From this Crown a great many Rays darted to the E. S. and W. but not toward the N. where only some whitish Streaks were to be seen, but very faint. Presently after this, the Part of the Arch extending to the East seemed to be suddenly kindled, as if some Train had been fired; grew extremely bright and vivid; and as if all
the

the red Matter had been then consumed, put an End to the Phænomenon before Eight.

During the rest of the Evening, a pale Light covered the South Part of the Heavens, as if the Moon had shone.

V. *A Letter from Mr. Christopher Maire to the President, containing Observations made at Rome of the Eclipse of the Moon, Dec. 23. 1749; and of that of the Sun, Jan. 8. 1750.*

Honour'd Sir,

Read Febr 1. 1749. **I**. Herewith send you my Observation of the two late Eclipses, to be communicated, if you please, to the Royal Society. The 23d of *December*, on which happened that of the Moon, was so boisterous a Day, that I despair'd of being able to see it, and for that Reason neglected to put my Micrometer in Order. My Clock had likewise been altered without my Knowledge, on which Account I betook myself too late to the Observation, as will appear by the following Detail. The Place of both Observations is in the Latitude of $41^{\circ} 54' 0''$. four Seconds of Time Eastward of *St. Peter's*. For I take

it

it for granted that the *Thermæ Dioclesianæ* are, according to *Bianchini's* Determination, in the Latitude of $41^{\circ} 54' 27''$.

Eclipse of the Moon, Dec. 23. 1749.

Chord of the Part eclipsed	13 Min. as was		
deduc'd from the Map of the Moon	-	7 ^h 47' 18"	
Hence Beginning of the Eclipse	-	7 40 53	
The Shade to <i>Tycho</i> and <i>Capuanus</i>	-	7 54 3	
<i>Tycho</i> intirely covered	- - -	7 55 56	
Shade to <i>Fracastorius</i>	- - -	8 28 43	
<i>Fracastorius</i> quite hid	- - -	8 30 24	
<i>Tycho</i> intirely disengaged	- - -	9 30 24	
End of the Eclipse, as far as could be			
perceiv'd thro' a thin Cloud	- -	10 0 16	

I judg'd the Eclipse to be somewhat less than five Digits.

Solar Eclipse, Jan. 8. 1750.

Beginning by a Reflector of Mr. <i>Short</i> ,			
Jan. 7.	- - - - -	20 ^h 34' 35"	
The first Spot covered	- - - - -	20 49 50	
The rest could not be observed for the			
Clouds	- - - - -		
Quantity of the Eclipse	7 Dig. 48. Min.	21 49 4	
Again more exactly	- 7 - 43 -	21 51 28	
The Sun appears for a Moment; Horns			
nearly horizontal	- - -	21 56 15	

Two Digits remain eclipsed	2	2	22 ^h 55' 37"
One Digit exactly	-	-	23 3 42
End of the Eclipse	-	-	23 11 32

The Observation was made with a 7 Foot Tube, 2610 Parts of the Micrometer just clasping the Sun's Diameter.

I am, with all possible Respect,

Honoured Sir,

Rome, Jan. 14. 1750.

*Your most Obedient
Humble Servant*

CHRISTOPHER MAIRE.

VI. *Some Observations on the Dragon-Fly or Libella of Pensilvania, collected from Mr. John Bartram's Letters, communicated by Peter Collinson, F. R. S.*

Read Feb. 1.
1749-50.

ABout the Beginning of May I observed many deformed Water-Insects, by Naturalists called *Hexipodes*, creep up out of the Water, and fix themselves on the Shrubs and Rushes; in this Situation they continue but a few Hours before their Back splits open; and from this deformed Case creeps out a beautiful Fly, with shining transparent Wings:

Wings: At its first Appearance there is only what one may call the Rudiments of Wings; but it is a most entertaining Sight to observe how they shoot out, and expand themselves: Thus, in less than an Hour, they have attained their complete Dimensions. During all this Operation the Creatures are immoveable, and so continue, until their Wings are dry; and then they fly swiftly away, roving about the Sides of Ponds and Rivers, seeking their Food, being Insects of Prey, are very voracious, and, like the Hawks among Birds, are very swift of Flight, and nimbly secure their Prey, which is mostly Flies, and small green Grasshoppers: They delight in Sunshine; in cloudy Weather they are rarely to be seen; but seek Protection under the Leaves and Boughs of Trees.

Towards the End of *May* the Female is ready to deposit her Eggs: She then seeks the warm quiet Sides of Ponds and Water-courses, continuing in a hovering Posture, dodging up and down in the Water: In this Action the Male seizes her, and with the End of his Tail catcheth fast hold by the Back of her Head, and flieth away with her. It is uncertain how long they continue in this Position before the Female bends the End of her Body, so as to penetrate the Part between the Belly and Breast of the Male. — In this singular and surprising manner she is impregnated; then she repairs again to those still shallow Waters, whose Bottoms are covered with Moss, Sticks, and Weeds, which may be a Security to the little Grubs. — Here she in a hovering Posture deposits her Eggs in the Water, which immediately sink, and find a proper *Nidus*
in

in the aquatic Moss, &c. The Eggs are soon hatch'd; the young Reptiles creep amongst the Stones and Weeds, &c. and so continue Water - Animals the greatest Part of the Year, until the Season comes round for their Appearance in that beautiful Fly before you, which is different from our *European*; but their Process I think well agrees with ours, as it is curiously described and delineated by that Excellent Naturalist Mr. *Reaumur*. They have a great Variety of this Tribe of Insects in *America*, as well as we have in *Europe*.

VII. Alberti Halleri *Archiatri & Consil. Aul. Reg. Medic. in Acad. Gottingens. Prof. & Reg. Soc. Lond. Sodal. Experimenta aliqua ad Respirationem pertinentia.*

Read Feb. 1. 1749-50. **C**Ontroversia de respirationis modo nuper exorta est, cujus historiam hic recensere nihil adinet. Sufficiat contraxisse experimenta in duo capita, quæ ad rem perficiendam spectant.

Dubium primum fuit, num musculi intercostales interni elevent costas, ut primus vester *Mayovius* invenit; an deprimant, ut olim *Galenus*, tum *Franciscus Bayle*, et alii.

Dubium alterum fuit, an aer elasticus reperiatur
T t inter

inter pleuram et pulmones, an omnino pulmones pleuræ continui sint.

Sexaginta fere viva animalia incidi, præter alia experimenta. In iis repertum est, quod nunc vobis **ILLUSTRES VIRI**, propono, rogatosque volo, ut repeti pericula jubeatis, atque, si omnino meis consentiunt, finem inponatis controversiæ.

Ad primam quæstionem. Cani religato nudentur muscoli pectoris, cute remota, in superiori maxime parte, ubi res evidentior est. Removeatur præterea pectoralis uterque, et destruaturn tantum de exterioribus intercostalibus, quantum sufficit ad observandam conditionem et actionem internorum.

Utile fuerit animal cogere, ut quam vehementissime inspiret: quod fiet inprimis pectoris altera parte foramine pertusa, ut aer subire, et alterum pulmonem inutilem reddere possit. Ita enim animal pulmone superstiti, quam maximo cum conatu utitur. Non tamen necesse est pleuram perforare, et irritatus canis, etiam absque ea vi valide respirat, si alcohole vulnus tangatur.

Adparebit ita, in inspirando, costarum intervalla quam proxime ad se invicem accedere, ut ultra medium sibi propiora fiant, musculos internos laborare vehementer, tumere, durescere, costas adscendere omnes, prima excepta, quæ tantillum movetur, rotari omnes circa punctum imaginarium, quod est in appendice cartilaginea haud longe a sterni, ut costæ pars sterni commissa descendat, pars a sterni remota adscendat, et extrorsum vertatur.

In expiratione descendunt costæ omnes, iterum prima excepta, quæ parum nutat; intervalla, in vehementi expiratione, longiora fiunt, et tenduntur, et qui-

quiescunt interni muscoli. Hæc ad primam quæstionem.

Ad alteram.

Sumatur animal quodcumque vivum aut mortuum, mergatur sub aqua, et sub aqua prudenter, ne pulmonem lædas, pertundatur pleura. Si aer elasticus est inter pleuram et pulmonem, bullæ adscendent per aquam. Si nullæ adscendunt, nullus adest aer. Id me rectius nôstis, et ex principiis patet.

Sed repetita satis experimenta feci. Bullæ nunquam adparuerunt in ullo experimento, et videor mihi nihil præcipitis corollarii inde deducere, si inde conclusero, nullum adeo elasticum aerem inter pleuram et pulmonem esse.

D. Gottingæ, d. 6. Jan. 1749.

VIII. *A Letter from Father Anthony Gaubil Jesuit, to Dr. Mortimer, Secr. R. S. containing some Account of the Knowledge of Geography among the Chinese, and of Paper-Money current there. Translated from the French by T. S. M. D. and F. R. S.*

Peking Nov. 9. 1748.

S I-R,

Read Feb. 1.
1749.

IT is now some time since I received from M. de L'isle Part of a Map of the World, found among the Papers of the late Dr. Kämpfer. In this Map were several *Chinese*

T t 2

Cha-

Characters, some well, some ill written, which the late Professor *Bayer* had attempted to decypher. — In my Answer to *Monf. de L'isle*, I informed him that it was by no means a *Chinese* Work*; that it could be of no Service to a learned *European*, such as he or you were; and that Mr. *Bayer's* Explanations were full of Faults. I suppose that M. *de L'isle* has already writ you my Thoughts concerning it from *Petersbourg*. You have possibly seen in several Books, what the *Chinese* know, and have set down, concerning foreign Countries: And there is no Monument extant to prove, that before the arrival of the Jesuits in this Country, they had Charts or Maps of the World, any way resembling that, which you found among *Kämpfer's* Writings.

It is now above sixteen hundred Years since they tolerably well knew the Northern and Eastern Countries of *India*, and those which lie between *China* and the *Caspian* Sea. On these different Countries their History affords several Informations, which are not to be found in the *Greek*, *Latin*, or other Historians. They had some, but very confused, Notions of the Regions beyond the *Caspian* Sea; such as *Syria*, *Greece*, *Egypt*, and some Parts of *Europe*. I do not speak of the Times of *Gentchiskan* and his Successors; for then the *Chinese* were made acquainted with *Russia*, *Poland*, *Germany*,

* Doubtless it is the Work of an *European*, who was giving some Notion of Geography to a *Chinese* or *Japanese*; or perhaps that of a *Chinese* or *Japanese* from Memory of what he had heard from *Europeans*, or of the Map which he might have seen with them.

Hungary, Greece, &c. from Accounts given by their own Countrymen who followed that Prince, his Sons, and Grandsons: But the Monuments that remain of this their Knowledge are very confused. As to the Countries to the East of *China*, there are Proofs remaining in Books, that, above seventeen-hundred Year ago, the *Chinese* were well acquainted with the Eastern Part of *Tartary* as far as the Sea, and the River *Ameur*, *Corea*, and *Japan*. Their Books speak also in general, and without sufficiently entering into Particulars, of many Countries to the East and to the North of *Japan*. With regard to the Monuments of the *Cap of Good Hope*, which have been mentioned by some, there are none in *China*; and if there have been any, they are now lost. It was from the *Europeans*, that the *Chinese* have learnt the Name and the Situation of the *Cape*: [and you will soon see a Dissertation, wherein all this Affair will be circumstantially treated].

I herewith send you two Paper Money-Bills; do me the Favour to accept them. Next Year we may possibly send something to *Canton*, either for you, or for your illustrious Society.

I am, with great Respect,

S I R, Yours, &c.

A. GAUBIL.

An Account of the above-mentioned Bills.

TWO Paper Money-Bills of the Reign of *Hongvou*.

The Year of Christ 1368. was the First of the Empire of *Hongvou*, Founder of the Dynasty of *Ming*. During the Dynasty of *Tuen* (who were *Mogul Tartars*) which *Hongvou* destroy'd, there was a great deal of Paper-Money. There had also been some, 140 Years before, under the Dynasty of *Kin* (oriental *Tartars*) who reign'd in the Northern Provinces of *China*, and in *Tartary*. The *Tuens* destroy'd this Dynasty, as well as that of the *Song's*, who were *Chinefe*, that reign'd in the Southern Provinces of *China*. We find no Paper Money of the Dynasties of the *Yuen's* and *Kin's*; and that of *Hongvou* is scarce. The *Bonzes* and *Chinefe* Empirics superstitiously say, that this Paper-Money laid upon Children brings them good Luck.

These two Bills are the same with those, the Figures and Explanations of which are to be seen in Father *du Halde's Description de la Chine*, Tom. II. pag. 168.

I send you the Two,* because probably you have none of that Sort.

The late Father *Dentrecolles* formerly sent to *France* an Account of the *Chinefe* Money, antient and modern: And some Notes and Remarks on this Sort of Money were of late Years sent hence to *Peterbourg*.

* One of which I presented to the Royal Society. *C. M.*

IX. *A Catalogue of the fifty Plants from Chelsea Garden, presented to the Royal Society, by the worshipful Company of Apothecaries for the Year 1747, pursuant to the Direction of Sir Hans Sloane, Bar^t. Med. Reg^r & Soc. Reg. nuper Præf. by John Wilmer, M. D. Hort. Chelf. Præfect. et Prælect. Botan.*

Presented 1251 **A** Lchimilla Alpina; Quinquefolii
Feb. 8. 1749. Fol. subtus argenteo. *I. R. H.* 508.

1252 Alyssoides incanum; folii sinuatis. *Inst. R. H.*
218.

1253 Alysson Creticum; foliis angulatis; flore violaceo. *T. Cor.* 15.

1254 Alysson Creticum saxatile; foliis undulatis incanis. *T. Cor.* 15.

1255 Asarum. *Dod. Pempt.* 358. *Officin.* 54.

1256 Astragalus luteus annuus Monspeliac. procumbens. *Mor. Hist.*

1257 Borrago Constantinopolitana; flore reflexo cæruleo, calyce Vesic. *T. Cor.*

1258 Buglossum Creticum verrucosum perlatum quibusdam. *H. R. Par.*

1259 Campanula minor annua foliis incis. *Mor. Hist.* 2. 458.

1260 Caryophyllata montana; flore luteo nutante. *H. R. Par.*

- 1261 *Cataria*, quæ *Nepeta* minor; foliis *Melissæ* *Tur-*
cicæ. Hort. Cath.
- 1262 *Chondrilla*, *Sonchi* foliis, flore purpurascente,
major. *Tourn.* 475.
- 1263 *Clutia* foliis petiolatis. *Lin. Hort. Cliff.*
- 1264 *Euonymus* vulgaris; granis rubentibus. *C. B.*
428.
- 1265 *Euonymus* latifolius. *C. B.* 428.
- 1266 *Erysiacum* Orientale, foliis *Sonchi*; flore sul-
phureo; siliquis longissimis *Boerb.*
- 1267 *Fritillaria* lutea; foliis *Polygonati*; fructu bre-
viore. *Boerb.* 2.139.
- 1268 *Geranium* latifolium; longissimâ acu *C.B.* 319.
- 1269 *Helianthemum* *Salicis* folio. *T.* 249.
- 1270 *Hermannia* frutescens; folio oblongo serrato.
T. 656.
- 1271 *Hesperis* sylvestris inodora. *C. B.* 202.
- 1272 *Hesperis* exigua lutea; folio dentato angustio.
Boerb. 2.20.
- 1273 *Hesperis* maritima, angustifolia incana. *T.* 223.
- 1274 *Hesperis*, caule ramosissimo; foliis lanceolatis
sæpius dentatis. *Lin. Hort. Cliff.*
- 1275 *Hesperis* flore albo minimo; siliqua longa; flo-
re profunde dentato. *Boerb. Ind.*
- 1276 *Lychnis* *Cretica* parvo flore; calyce striato pur-
purascente. *T. Cor.* 24.
- 1277 *Lychnis* supina Sicula, calyce amplissimo striato.
T. 337.
- 1278 *Leucoium* *Hesperidis* folio. *T.* 221.
- 1279 *Mespilus* *Canadensis*, *Sorbi* torminalis facie, *T.*
642.
- 1280 *Myrrhis* major, vel *Cicutaria* odorata. *C.B.* 160.
Officin. 321.

- 1281 Omphalodes Lusitanica, Lini folio. *T.* 140.
 1282 Padus Theophrasti, Dalechampio. *Lugd.* 312.
 1283 Pavia. *Boerb. Ind. Alt.* 2. 260.
 1284 Polygonatum latifolium; Hellebori albi foliis.
C. B. 303.
 1285 Pulmonaria maxima; foliis quasi saccharo in-
 crustatis. *Pluknet.*
 1286 Pulsatilla folio crassiore; et majore flore. *C. B.*
 177.
 1287 Ranunculus montanus; foliis Plantaginis. *C. B.*
 180.
 1288 Scrophularia Hispanica; Sambuci folio glabro.
T. 166.
 1289 Scrophularia maxima Lusitanica; Sambuci folio
 lanuginoso. *T.* 166.
 1290 Scrophularia peregrina. *Cam. Hort. Tab.* 43.
 1291 Sifymbrium Orientale; facie Barbaræ; foliis
 Plantaginis. *T. Corr.* 16.
 1292 Smyrniium. *Matth.* 773. *Officin.* 457.
 1293 Smyrniium peregrinum; folio oblongo. *C. B.*
 154.
 1294 Sorbus fativa. *C. B.* 415. *Officin.* 464.
 1295 Symphytum majus; tuberosa radice. *C. B.* 476.
 1296 Tordylium minus; limbo granulato; Syriacum.
Mor. Umb. 37.
 1297 Trifolium Clypeatum argenteum. *Alp. Exotic.*
 307.
 1298 Trifolium montanum; spica longissima rubente;
C. B. 328.
 1299 Turritis annua verna; flore purpurascente. *T.*
 224.
 1300 Vella. *Lin. Gen.* 654.

X. *A Letter from the Rev. Henry Miles, D.D. and F.R.S. to Mr. Henry Baker, F.R.S. concerning the green Mould on Fire-Wood; with some Observations of Mr. Baker's upon the Minuteness of the Seeds of some Plants.*

Dear SIR,

Read Feb. 15.

1749.

I Offer you a short Account of a Microscopic Object, together with a Specimen of the same, for your own Observation, at leisure.

Some Days ago, happening to take Notice of a Quantity of what we commonly call Mou'd *, on the Bark of some Fire-Wood, I had the Curiosity to view it with a Lens, of about an Inch Focus, which I carry about me, when I found it to consist of Numbers of minute *Fungus's*, whose regular Appearance invited me to examine them in the Microscope, with a good Magnifier; upon which their spherical Heads seem'd as if they had been nothing else but Globules of Seeds; at the same time, I observ'd several Seeds adhering to the transparent Footstalks, which supported the Heads, and many scattered on the Glass-Plate, whereon the Substance was placed, in order to be view'd. And here I had an Oppor-

* Of a bright verdegriſe Colour.

tunity of seeing many distinct Seeds, which appeared, nearly, of an oval Form, but several times larger than the Seeds of common Mushrooms, even when seen with the second Magnifier, and the latter with the first.

I pretend not to any Skill in Botany ; sometimes, and, indeed, but seldom, I look into an Author on the Subject, as an Amusement and Relief to my Mind ; therefore it would ill become me to attempt the referring this Plant to the proper Class. *Micheli*, in his *Nova plantarum genera*, has given us the Draught of some, which well represent the Figure of them, as they appear, when much magnified, TAB. LXXXII. *Fig. 1.* and in page 200. of his excellent Work, describeth them, under this Title, *Fungoidastri semine in superna parte donati* : But then his Figures are such as the Plants appear to have, to the naked Eye (as we may presume, since he does not say any thing to the contrary ; nor to mention that there are other different Characteristics in his Description. The same celebrated Writer describes another Species, p. 215. under the following Title, *Mucorea pediculo donati*, which in respect of Size, the Substance, and some other Characters, correspond with these I am speaking of, well enough : But as he refers to Dr. *Hooke's* Micrographia, TAB. XII. for an elegant Figure of them (besides what he has himself given us TAB. 95.), both Dr. *Hooke's* and his own Figures represent the Heads, as quite smooth, on the Surface ; and the Doctor, in his Description of them p. 126. expressly says they are of *a smooth Surface*. Whence I conclude this must be a different Species. However what the ingenious

Author of the *Micrographia restaurata* says of the Seeds of these diminutive Bodies, p. 19. is put out of all doubt.

Permit me to add, that having often viewed the Heads of a small kind of *Fungus*, which are about $\frac{1}{8}$ Inch Diameter, of a coriaceous Substance, I have ever found the Seeds which are produced on the Gills) much larger than those of any Mushrooms I ever examined, tho' rather less than those produced by this unregarded Plant.

Now, that a Body whose Form is not to be distinguished by the unassisted Eye, should produce Seeds several times larger than another of the same *Genus* does, which exceedeth it many Millions of times in Bulk, must suggest those Thoughts to one's Mind, which, I know, I need not point out to you: I shall therefore only beg Leave to assure you, that I am,

Dear Sir,

Your very much obliged

and obedient humble Servant,

Tooting, Jan. 31.
1749-50.

H. MILES.

Some

Some Observations on the above-mentioned Plants and Seeds By Henry Baker, F. R. S.

I Have carefully examined the Plants and Seeds sent me by Doctor *Miles*, in order to determine their real Bigness; and, taking the fungous Heads of the middle Size (some being larger and others smaller), I find, according to my Micrometer, that three of them take up the Side of a Square, 70 of which Squares make an Inch in Length, and consequently, that 3 times 70, or 210 of these *Fungi* are required to make a Line whose Length is one Inch; or, in other Words, that the Diameter of these fungous Bodies is, at a Medium, the 210th Part of an Inch.

The Seeds are oval; and I find, by the same Micrometer, that 10 of them laid by one another the shortest Way of their Diameter, or 8 of them the longest Way, fill up the Side of a Square, 270 of which Squares make an Inch in Length.—Taking therefore 9 at the Medium, 270 times 9, or 2430 of these Seeds will be required to make a Line of an Inch in Length; or, in other Words, each Seed is the 2430th Part of an Inch in Diameter.

And according to these Calculations 44,100 of the fungous Heads, or 5,904,900 of the Seeds may lie by one another in the Surface of an Inch square.

Yet minute as the Seeds of this little Fungus are, Dr. *Miles* observes, very justly, that they are larger than the Seeds of some Mushrooms, which exceed it many Millions of times in Bigness. As to which, I beg Leave to take Notice, that the Proportion, in Size of the Fruits or Seeds of Trees or Plants, to the

the Size of the Trees or Plants that bear them, comes under no Regulations that correspond with our Conceptions. For the vast Bulk of some sorts of Timber-trees (the Beech and Ash, for Instance) is produced from a Seed smaller than that of the common Garden Bean. The towering and mighty Oak produces for its Fruit only a little Acorn, whereas the Pumpkin (some whereof weigh above an hundred Pounds) is the Production of a feeble creeping Plant, unable to support itself, and much less its enormous Fruit. The *Vanilla* (a Plant that rises to the Height of several Feet, by clasping about whatever it finds near it) produces, in long Pods, Seeds so small, that their Diameter is not more than the 100th Part of an Inch. Supposing therefore the Cavity of the Pod to be equal to a cylindrical Tube of $\frac{1}{10}$ of an Inch Diameter, and the Length of the Pod to be six Inches (which Dimensions are taken with great Moderation) the Number of Seeds contained in one single Pod will be more than 47000. Most Kinds of Fern, of which some are pretty large Plants, bear Seeds so extremely minute, that they appear to the naked Eye only like a fine Dust; while Seeds of a considerable Bigness are produced by Plants of a great deal smaller Size. But many of the Gentlemen here present are so much better acquainted with these Matters than I can pretend to be, that I shall only presume to add, with how much Zeal I am

The Royal Society's

London, Feb. 7.
1749-50.

Most devoted and obedient
humble Servant

H. BAKER.

XI. *An Observation of the Eclipse of the Sun on Jan. 8. 1750. N. S. taken at the Observatory at Berlin, by M. Grischow jun. and M. Kies. Translated from the French.*

Read Feb. 15.

1749-50.

	h ' "
THE Beginning was at	8 59 19½ true Time.
The End of the Eclipse at	11 20 5½

The whole Duration	2 20 46
--------------------	---------

The Observations were made with the greatest Exactness, the Weather being as favourable as could be wished, the whole Time.

M. *Euler* observed in his own House, which stands a little to the West of the S. W. of the Observatory, at the Distance of 190 *Rhinland* Yards (*Verges*) in a strait Line, that

	h ' "
The Beginning was at	8 58 30 true Time.
And the End at	11 19 50

The whole Duration	2 21 0
--------------------	--------

That is, 34" more than at the Observatory.

The Diameter of the Umbra was 6½ *Rhinland* Inches.

XII. Alberti Haller, *Archiatri et Consil. Aul.*
Reg. in Acad. Gottingenf. Medicinæ Prof.
necnon R. S. Lond. Sodalis, Observationes
de Viis Seminis.

Read Feb. 15. **C**UM in testium vesicularum fabrica
 1749-50. aliqua mihi contigerit invenisse, quæ
 non inutilia videantur, ea Vobis, Sodales Illustres, con-
 sideranda propono, quorum antecessoribus pene ante
 centum annos *Claudius Uberius* aprugni testis fabri-
 cam dicavit *Phil. Transf.* n. 42.

Testium quidem filamentosa fabrica ex flavescentibus vasculis compacta, passim nota est. Ea vero vasa quæ semen confectum in iis vasculis exportant, et ad epididymidem convehunt, ea quidem semper dubia fuerunt.

Solus hæcenus *Regnerus de Graaf* ad veritatem cominus accessit; recentiores scriptores infra ejus inventa substiterunt.

Repletur ergo epididymis per ductum deferentem, lente et prudenter, argento vivo, subsistendo subinde, aut in calidam mergendo testem, ut sensim vasa expansa cedant; nam subita repletio facillime mediam aut summam epididymida rumpit.

Ita mihi duodecies aut ultra adparuit, epididymidem quidem per totam longitudinem suam, qua testi adhaeret, capite excepto, unicum subtilem canalem esse, qui explicari queat, et ex plicis per cellulosam revinctis resolvi. Recte hoc vidit, quem laudavi *Graafius de part. genit. vir.* p. 65. T. I. f. 2.

In suprema parte epididymidis, quam caput vocavit, (TAB. II. *Fig. 1. d*) et quæ validius albugineænectitur, fabrica

fabrica alia est: Ibi enim unicus iste canalis finditur in decem, duodecim, forte plures canales, qui nonnunquam valde subtiles, alias autem ipso ductu, qui epididymidem complicatus fuit, multo crassiores sunt. Hos canales vocabimus, brevitatis causa, *Vasa efferentia semen* (F. I. eeeee).

Singulum plicatum et in conum congestum proprium fasciculum efficit, et retrogrado ductu versus inferiorem partem testis redit, intraque albugineum in testis partem venit, quæ media est inter summam partem imamque, qua etiam parte epididymis ab altero latere libera, ab altera unice adhæret. Hæc vasa conosque saris recte repræsentavit idem *R. de Graaf*, T. 3. f. 3. T. II. f. 1. In icone nostra diducta exprimuntur (F. I. f. f). Ea vasa sensim in testis superficie, quæ albuginæ continua est, exorriguntur, et sibi parallela et conjuncta *rete* efficiunt. (F. I. g. g)

Ex ea conjunctione fit, ut non raro uno vel duobus tantum vasculis efferentibus ab epididymide repletis omnia turgeant, et argentum vivum manifesto per ea vasa, quæ argentum receperunt, retrogrado metallo etiam in ea parte, quæ testis prior est, repleantur. Hoc rete ea fere longitudine est partis semiliberæ ductus epididymidis. Solus cam vidit *Graafius* et depinxit T. 4. f. 4. ut tamen parallela nimis vascula, neque mediis ramis conjuncta, aut pingat aut describat. Nimis etiam longa et paria fere testis fecit. Reliqui Anatomici omnes aut pro ductu unico, aut pro cæca membrana habuerunt.

Ab eo rete in testis carnem musculosam cum singulo celluloso septo, singulum vasculum venit, et ad eam testis divisi provinciam descendit. Hæc vascula absque plicis sunt ampliora multo quam crederes, et

quàm epididymidis, magis vasculum tenera, ut a pondere argenti vivi facile rumpantur. A rectitudine *recta vascula testis* voco.

Hæc recta vascula inserta sibi recipiunt *vascula testis serpentina* flavescentia, quæ adeo pulchre in capillos resolvebat *Ruyschius*. Aliquoties contigit, ut fluidum metallum etiam hæc tenerrima vascula subiverit, ut omnino cavos canales esse minime dubitari possit.

Ea est adeo testis fabrica, ut in *serpentinis vasculis* semen flavescent generetur, id deponatur in vasa *recta*, inde in *rete* sub albuginea positum, tunc per *vascula efferentia* tortuosa in epididymidem veniat.

Ex epididymide duplex via est seminis, altera recondita, de qua nunc dicendi locus est, altera vulgo nota ad vesiculas.

Illam argento vivo immisso nunc ter omnino detexi.

Vasculum unicum, nec enim plura vidi, de media epididymide decedit, in rectitudinem exporrigitur, una cum vasis testis ascendit, nunquam ad finem usque a me deductum, sed proculdubio ad lymphatica vasa pertinens, quæ sæpe in funiculo vasorum spermaticorum humano vidi. Hæc sunt vascula minima in abdomine, quæ per vas deferens replebat in lepore, *Ruyschius Catal. Mus.* p. 152. Nam etsi unicum hæcenus vidi, minime repugno plura esse. Resorbendo humori, adeoque crassiori reddendo semini, destinari valde probabile fit.

Altera via manifesta est, qua ad vesiculas seminales semen ducitur; in ea Mercurius injectus aliqua etiam nobis patefecit.

Non quidem valde urgebo ductum deferentem recta in urethram continuari, huic ad angulum valde acutum

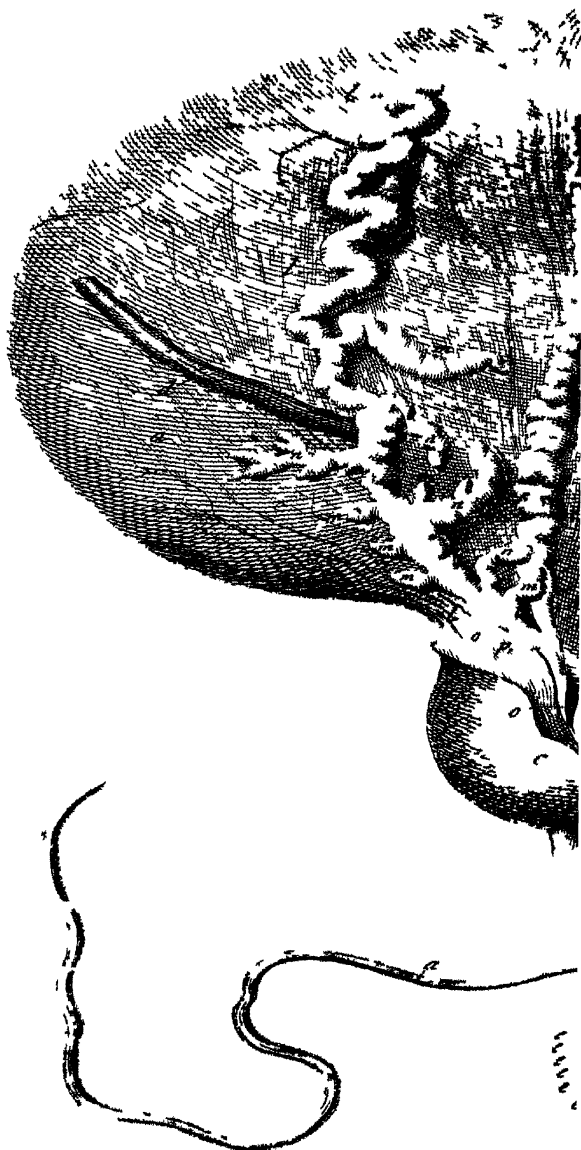




Fig. 2 p. 313.
341

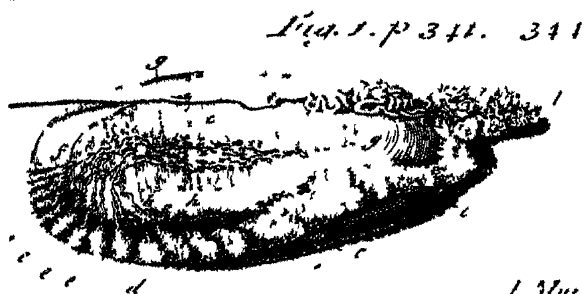


Fig. 1. p 341. 341

acutum inferi ductum excretorium vesiculæ seminalis, qui ductu urethrico minor est (Fig. 2. *o p*); et tamen liquores injectos in ductu deferente facile in vesiculam subire. Hæc enim vulgo nota sunt.

Neque monebo fuscæ ex ductu deferente, cujus pars, quæ vesicæ subjicitur, in cellulas plicatur, argentum vivum in urethram facile delabi, quod non ita de semine observatur unquam, ut in vivo homine potentiam aliquam esse necesse sit, quæ extra tempora venerci oestri coerceat semen, neque sinat in urethram sani hominis venire, quin prius in vesiculam adscenderit. Ea potentia potest in ipsâ densitate comprimentis prostatae poni, vel in alia causâ, nobis ignota.

Sed id imprimis volo, vesiculam seminalem quamlibet unicum esse intestinulum, cui multæ cæcæ appendices inserantur. Id adparet, quando Mercurio vel cera repleta vesicula resolvitur, dissecâtis patienter telis cellulosis, quæ et princeps intestinulum, et cæcæ appendices religant. Sæpe præparavi, multum inveniri in appendicibus diversitatis, in longitudine, simplicitate, directione, diametro. Hæc tamen communia sunt. Intestinulum princeps vesiculæ (*l l*) in crassum obtusum cæcum conum terminatur. In hoc intestinulum octo, decemve inferuntur appendices (*m m n n*), quarum primæ solent ramosæ esse (ut *m n*), non tamen constanter; ultimæ potius simplices sunt (ut *m m*). Aliquid simile et *Leal. Lealis* vidit, et *Henricus Bassius, Observ. Anat. Chir. Dec. i. n. V. T. 2. ff*; sed ille nimis breves appendiculas fecit, tum iste, anulumque is præterea addidit, quem certo novi plicam esse, non verum circulum. Unice addo, adeo magnas et compositas appendices me vidisse, ut quæ truncus sit, quæ appendix, non facile definires.

ICONUM EXPLICATIO.

T A B. II.

FIG. I. *Testis Mercurio repletus.*

- a* Ductus deferens, sensim complicatis vasis.
b Pars ima, ubi contra seipsum adscendere incipit cum epididymidis nomine.
c Epididymis tota repleta ex serpentino vasculo composita.
d Caput epididymidis dissolutum.
e e e e e Totidem coni vasculosi, in quos caput epididymidis resolvitur.
f f Vascula efferentia semen ex conis orta, pauca notavi literis, ne iconem corrumperem.
g g Rete testis.
h h Aliquot ductus rectilinei. Reliqui globuli dissoluti sunt ab argento vivo, per rupta aliqua vascula effuso, quos volui expressos, ne quidquam veritati iconis decederet.
i Caro testis nuda.

FIG. 2.

- a a* Vesica urinaria.
b Fibrarum longitudinalium planum posterius.
c Prostata.
d d Ureteres.
e Arteriæ vesicularum.
f g Ductus deferentes in celluloso sine suo.
h Vesicula seminalis dextra, non mutata.
i Ductus seminifer, qui prostatam perforat.
l Vesicula seminalis sinistra cera repleta et expedita.
 Dissolutis corniculis hinc multo longior.

m m Cæcæ appendices vesiculæ, quæ in hoc cada-
vere breves fuerunt.

n n Appendices aliquæ ramosæ.

o Ductus feminifer per prostatam euns.

p Ductus vesiculæ excretorius ipsi insertus.

XIII. *A Letter from John Martyn, M. D.*
Prof. Botan. Cantab. & F.R.S. *to the Presi-*
dent, concerning an Aurora Borealis seen
February 16. 1749-50.

S I R,

Chelsey, Feb. 21. 1749-50.

Read Feb. 22
1749-50.

ON Friday the 16th there was a bright
Aurora Borealis, the Northern Part
of the Sky being intirely filled with a pale Light, in
which frequent Coruscations were visible. Besides
these Lights, there was a perfect uniform Arch, ex-
tending from East to West: the Colour of it was the
same with that of the *Aurora*; with which however
it did not seem to have any Communication, being
placed several Degrees to the Southward. The Shoul-
ders of *Orion* were visible thro' this luminous Arch,
in the Western Part of it, and *Cor Leonis* in the
Eastern Part. I did not happen to see it till about
a Quarter before Ten; and at Ten it disappeared.
The Weather was then, and has been ever since, ex-
ceedingly warm for the Season. The Walls are
covered with Blossoms; and the Hyacinths, Daffodils,
&c. are blown before the usual time. I am, with
the greatest Respect,

S I R,

Your most humble Servant,
JOHN MARTYN.

XIV. *A Letter from the Rev. Henry Miles,
D.D. and F.R.S. to Henry Baker, F.R.S.
concerning an Aurora Borealis seen Jan.
23. 1750-51.*

Dear Sir,

*Read Feb. 22.
1749.*

ON Tuesday, 23^d of January last, I was called out, about Six in the Evening, to see a strange Appearance in the Sky, in the West. Suspecting it to be an ordinary *Aurora*, I did not make great Haste—When I came out, I saw a Cloud (not large) of an obscure red Colour, but much deeper than any I had ever seen before, which, I was informed, rose from the S. W. it was then advancing apace to the N. E. and quickly reached the Zenith, when, it being intercepted by the House, I hastened to the other Front, which regards the N. E. by which time there appeared a luminous Zone, about the Breadth of the Galaxy, its Edges regularly defined, compassing the Hemisphere, from the Horizon in the N. E. to the Zenith, in the same Direction, in which the above-mentioned Cloud had passed (as far as I saw its Course) from the S. W. The Colour was much fainter, and more luminous, resembling the usual Colour of an *Aurora*, and the *Laminae* or Streamers soon appeared—upon this, not being well fenced against the Wind, which blew brisk, I went in, to pursue my Intention of viewing the two beautiful Planets, *Jupiter* and *Venus*, with a reflecting Telescope, made by my ingenious Friend Mr. *Short* of *Surrey-street* (the greatest magnifying Power of which is about 200 Times); and after I had viewed

viewed them to my Satisfaction, and shewed them to some Friends, when I was about to put up the Instrument, a Cloud, of near the Size of the first, but not so deep a Colour, appeared, rising up from the S. W. which proceeded in a Line with the Planets, and, in a little time, surrounded both: *Venus* appearing still, to the naked Eye, in her full Lustre, I immediately viewed her with the Telescope, without altering the *Focus*, and saw her much more distinctly than ever I had done, on that Evening, or on any other, and of the same Opinion were all my Friends as to the Sight they had of her, on that Occasion: We all saw her Spots plain, resembling those in the Moon; which I was never so happy as to have a Sight of before—and this, while the Cloud seemed to surround it, as much as ever: But whether the Vapour might be really rarer near the Planet, than it was at some Distance, no Judgment could be made, because of her too powerful Light.

Many have observed the fixed Stars to appear thro' the Vapour with an undiminished Light oftentimes: And our great Dr. *Halley* tells us, in his Account of that remarkable *Aurora*, which was seen in *March*, 1715-16. that he observed “one of the *Laminae* pass successively over all the Stars of the little Bear, without effacing the smaller ones, in the Tail, of the fifth Magnitude; such was the extreme Rarity and Perspicuity of the Matter whereof it consisted.” *Phil. Trans.* N° 347.

I had the Honour this Week to receive a Letter from Dr. *Short* of *Sheffield*, the Author of an Account of several Meteors, in the *Phil. Trans.* N° 459. in which he says, “The 23d past, at Six at Night, the
“ Sky

“ Sky being overclouded, all the Clouds over the
 “ Hemisphere, turned of a sudden to a deep blood-
 “ red Colour, for fifteen Minutes; then succeeded red
 “ Streamers for half an Hour.”

Tooting, Feb. 16.
 1749-50.

*I am your, and the
 Royal Society's,
 most obedient Servant,*

H. MILES.

XV. *A Letter from Mr. William Watson,
 F. R. S. to the Royal Society, declaring
 that he as well as many others have not been
 able to make Odours pass thro' Glass by
 means of Electricity; and giving a parti-
 cular Account of Professor Bosc at Wittem-
 berg his Experiment of Beatification, or
 causing a Glory to appear round a Man's
 Head by Electricity.*

GENTLEMEN,

Read Mar. 1. **T**HE Inquiry into the Nature and
 1749-50. Properties of Electricity has been,
 within these few Years, the Pursuit of many excel-
 lent and ingenious Persons; and most of its extraor-
 dinary Phænomena, which have been made to appear
 in one Place, have, with proper Attention to the
 requisite Circumstances, appeared in others: But
 there

there have happened two very remarkable Exceptions to this Rule. The first is, that the Odours of odoriferous Substances do not only pervade, from Friction, the Glasses which contain them, but that these Odours were carried along with the Current of Electricity into such non-electric Bodies as were destined to receive them, and manifested themselves in those Bodies by communicating to them their Smell, and other Properties. These, and other things yet more extraordinary, were said to have been performed by Mr. *Pivati* at *Venice*, and to have been repeated by Mr. *Winkler* at *Leipsick*; but, though no Care or Expence has been spared, either by Abbé *Nollet* at *Paris*, Mr. *Jallabert* at *Geneva*, Mr. *Bosc* at *Wittemberg*, *Pere Garo* at *Turin*, and by myself at *London*, to bring about the same Effects, they have hitherto been unsuccessful. For which Reason the Truth of these Relations has been greatly questioned by many; as Mr. *Buccamare*, in a * Treatise since published, says, that Mr. *Pivati* confessed to those, who addressed themselves to him to see the Experiments, that more especially made with Balsam of *Peru*, that it never succeeded but once, and that he could never repeat it. I likewise received Yesterday a Letter from our worthy Brother Abbé *Nollet*, who is just returned to *Paris* from *Turin* and *Italy*. He says, that his first Care was to inquire into the Truth of those Wonders in Electricity, of which we have heard so much for almost three Years, and which have not succeeded either with himself or me: And he imagines the Royal Society would be glad to

* *Tentamen de vi Electric.* 8cc. p. 183.

know what they really were: For which Reason he has just now sent a Memoir to the Duke of *Richmond*, in which will be seen the most circumstantial Account he has been able to procure of them at *Turin*, at *Venice*, and at *Bologna*. For his own Part, he thinks that there has been a great deal of Prejudice, Credulity, and Exaggeration; to which may be added, very little Care and Caution in making these Experiments. He is now sorry he has lost so much time in attempting to make them; and thinks Mr. *Winckler* has been too hasty in asserting, that he had repeated these *Italian* Experiments: But why should he call them *Italian*, when the Nation he says will not allow the Appellation, and except three Persons, he finds there no Defender of what has been said to be done; and adds, that there is not a Philosopher of Repute there, who believes them any more than himself?

This Experiment then seems not to arrive at what we have been told; but, for further Information, we must wait till the Reception of Abbé *Nollet's* Memoir.

The other is, an Experiment called by Professor *Bose* at *Wittemburg*, the *Apotheosis* or Beatification. The making this Experiment, in the Manner mentioned by this Gentleman in his Writings, has been attained to by none. He says, if in electrifying you employ large Globes, and place a Man upon a large Cake of Pitch, by little and little a lambent Flame arises from the Pitch, and spreads itself around his Feet; from hence by Degrees it is propagated to his Knees, his Body, and at last to his Head: That then by continuing the Electrification the Man's Head is

sur-

surrounded by a Glory, such a one in some measure, as is represented by Painters in their ornamenting the Heads of Saints: That in this State if the elected Man is touched by one that is not, the Pain felt by both is very severe, reaches from the Finger to the Shoulder, and remains a long time. Professor *Bose*, in another Part of his * Writings, says, That the Beatification indeed does not always succeed with him; that sometimes, when other Circumstances have been very favourable, a Man will be beatified by one Sphere in two Minutes; at other times, two or three Globes will not do it under six or eight Minutes; and even at sometimes after twenty Minutes, when five or six Globes were made use of, no Light has been visible: That under the same Circumstances, when one Person was capable of being beatified, another was not. This is a short Account of Professor *Bose's* Beatification, given in his Writings, in which, nevertheless, nothing of what he says essential to the Operation is omitted.

This Experiment, which was not only a desirable Thing to be seen, but as it seemed to communicate to non-electric Bodies a greater Quantity of Electricity than any other did, that of *Leyden* excepted, I was very desirous of repeating: But though I omitted no Trouble, and varied not the least Circumstance, that could any ways conduce thereto, I was disappointed. I tried the combined Force, of many Globes, of different Machines, in the best Weather, and with different Persons, but no Radiation in the manner before-mentioned. When I underwent this Operation my-

* De Electric. comment. novus, pag. xvi.

self, supported by solid Electrics *per se* of more than three Feet high, and as much distant from the Sides of the Room as possible to prevent the escaping of the electric Matter, I found in myself, as several others did, a tingling upon the Skin in my Head, and in many Parts of my Body such a Sensation as would be felt from a vast Number of Insects crawling upon our Bodies at the same time; but I constantly observed this Sensation to be greatest in those Parts of my Body which were nearest any Non-electric; but still no Light upon the Head, though to make the Eye more ready to observe it, this Experiment was made in the Dark for some Continuance. The Sensation of the Snaps in this State were very acute. If the Hand of a Bylander was brought near the Back of the Hand of the Person electrified, the Hairs thereupon sent forth a great Number of luminous Points; and if a Bunch of fine Lace Wire was placed upon his Head, you saw a great deal more of the same Appearance; but this was always most brilliant in those Parts nearest the Non-electric, and still more, when the Non-electric was brought to a proper Distance. But this was vastly short of that mentioned by Mr. *Bose*, not only in its Lustre, but as it never was general, hardly ever shewing itself in two Parts of the Body at the same time. This want of Success after many Trials, as I by no means doubted Mr. *Bose's* Veracity, induced me to conclude, that either some very essential Part of the Apparatus had been suppressed by the Author, or that the Air of *Germany*, being upon the Continent, was more dry, and more fit, than that of our Island. It was difficult indeed to allow this
last,

last, as the Experiment had failed here, after the long Continuance of a very dry Season. This want of Success occasioned many Persons here, well versed in these Matters, to conclude, that the Experiments in Electricity had been carried further in *Germany* than in *England*.

However, sometime after, I found that this Experiment, in the Manner before mentioned, had been made no-where upon the Continent, *Wittemberg* excepted; and our worthy Brother Mr. *Jallabert* at *Geneva*, in his excellent * Treatise upon Electricity, says, That he had likewise attempted it; but instead of Beatification, he saw from the Hair of the Head of the Person electrified, especially from the back Part thereof, a great Number of luminous Points. These, he says, were likewise observable upon his Cloaths, which were made of a Mixture of Thread and Cotton, more especially upon their Borders. When the Person electrified changed his Situation upon the Pitch, upon which he stood, the Place he left appeared luminous. What this Gentleman mentions besides is very near alike to what I myself experienced, and what I have just now related. He says likewise, That he believes Mr. *Bosc* had been the only Person, who had made the Beatification succeed.

A Person here however, that we should not even seem to be outdone by our Neighbours, exhibited to the Public the famous Experiment of *Beatification*, found out, as he says, by a *German* Professor. Whether he knew how this Experiment was said to be

* *Experiences sur l'Electricité*, p. 50.

done, or whether it was with him as with many of the Discoverers of the Longitude, and of the Quadrature of the Circle, I do not determine; but thus it is, that his Experiment has been exhibited as Mr. *Bose's* for two or three Years.

I am unwilling to be thought to detract from the Merit of this Experiment, which I think a very beautiful one; but I take upon me to say, that it differs as essentially from every Part of that, said to have been made by Professor *Bose*, as any two electrical Experiments soever.

In a Letter, I wrote the Beginning of last Year, to my Correspondent Mr. *Bose*, among other things, I acquainted him of my not being able to make the beatifying Experiment succeed; and that, as far as I had yet heard, nobody any-where had been able to do it, so that the Power of seeing this extraordinary Phenomenon was yet with himself alone. I desired of him further, that if any material Part of the Process had been omitted in his Writings, he would communicate it; for that some People here were not quite satisfied of its having ever been made. To this he was so obliging as to send an Answer nearly in the following Words, “ As to my Beatification, “ I am highly obliged to you for writing to me so “ freely and candidly about it; and I will discover “ to you my whole Artifice without any Retention, “ though I concealed the same from all my Friends “ and Correspondents: But, Sir, it is true, that I “ have embellished a little my Beatification by my “ Style and Expressions; but it is also true, that “ the Basis of the Phenomenon is constant. I “ found in our Armoury at *Leipzig*, a whole Suit
“ of

“ of Armour, which was decked with many Bullions
 “ of Steel; some pointed like a Nail; others in
 “ Form like a Wedge; others pyramidal. In the
 “ dark, you well know, that not all, but very many,
 “ of the said Bullions will sparkle and glister with
 “ Tai's like Comets: And it is clear, that when the
 “ Electricity is very vigorous, the Helmet upon the
 “ Head of the Person electrified will dart forth Rays
 “ like those round the Head of a canonised Saint;
 “ and this is my Beatification. You are the first, Sir,
 “ with whom I trust my Mystery, which if you
 “ communicate to the *Royal Society*, I hope you
 “ will take care of its being inserted in the *Philo-*
 “ *sophical Transactions*, that the Beatification did
 “ not succeed until I communicated my Method.
 “ Many People have imagined this Experiment
 “ of mine to be extravagant and false. If the
 “ Armour is not ornamented with Steel Bullions,
 “ I believe it will not succeed. If the Armour is
 “ well enriched with Bullions, and well polished,
 “ the Comets appear twice, once in the Air, and
 “ once by Reflexion from the Armour. A Sto-
 “ macher, or a Doublet, set with Nails or Needles,
 “ will exhibit a small Degree of Beatification.”

Thus far Mr. *Bose*, to whom I am very much ob-
 liged, for the Discovery of his Process; I cannot but
 be sorry for his having, as he says, embellished his
 Relation by his Style and Expressions. The Language
 of Philosophers should not be tainted with the Li-
 cence of the Poets; their Aim in the communicating
 their Discoveries to the World, should be simple
 Truth without desiring to exaggerate; as we con-
 stantly see enough to raise our Admiration every
 Step

Step we take in investigating the Operation of Nature.

The electrifying a Man in polished Armour, with several Globes, must exhibit a very beautiful Phenomenon, by the Electricity running off from several of the Points; but I cannot but say, it must fall greatly short of the general Radiation promised and expected from the preceding Accounts.

This, Gentlemen, is the Information I have been able to procure, concerning these two Experiments, of which we have heard so much, and which I apprehended would not be unacceptable to be laid before you. I am glad of every Opportunity of testifying the Regard, wherewith I am

Your most Obedient

March 1. 1749.

Humble Servant,

W. WATSON.

XVI. Part of a Letter from Mr. Professor Euler to the Reverend Mr. Wetstein, Chaplain to his Royal Highness the Prince, concerning the Contraction of the Orbits of the Planets. Translated from the French by T. S. M. D. and F. R. S.

Berlin, Dec. 20. 1749.

Read March 1.
1749.

YOU have done me much Honour in communicating an Extract of my last Letter* to the illustrious *Royal Society*, No-

* See *Philos. Transf.* No. 493. p. 203.

ember 2. 1749. I am still thoroughly convinced of the Truth of what I advanced therein, that the Orbs of the Planets continue to be contracted, and consequently their periodical Times grow shorter. But in order to put this Fact out of Doubt, we ought to be furnished with good ancient Observations, and also to be very sure of the Time elapsed, since those Observations, to this Day: Which we are not, with regard to the Observations that *Ptolemy* has left us. For Chronologists, in fixing the Moments of those Observations, run into a Mistake, by supposing the Sun's mean Motion to be known; which ought rather itself to be determined by these same Observations. Now, if we reduce the Days marked by *Ptolemy* to the *Julian* Kalendar, we run the Risk of committing an Error of a Day or two, in the whole Number of Days elapsed, from that to our Time; because the Course of the *Julian* Years, according to which every fourth ought to have been *Bissextile*, has been frequently interrupted by the *Pontifices*; of which we find some sure Marks in *Censorinus* and *Dion Cassius*. Wherefore it might well happen, since the Times mark'd by *Ptolemy*, that there has really been a Day or two more than we reckon, and consequently, that *Ptolemy's* Equinoxes, ought to be put a Day or two back; which would lengthen the Years of those Times. I was in hopes, that the *Arabian* Observations would not be liable to this Inconvenience; because the *Julian* Kalendar has not been interrupted for these last past twelve hundred Years. The late Dr. *Halley* had also remark'd, that the Revolutions of the Moon are quicker at present than they were

in the Time of the ancient *Chaldeans*, who have left us some Observations of Eclipses. But as we measure the Length of Years by the Number of Days, and Parts of a Day, which are contained in each of them; it is a new Question, Whether the Days, or the Revolutions of the Earth round its Axis, have always been of the same Length. This is unanimously supposed, without our being able to produce the least Proof of it: Nor indeed do I see, how it could be possible to perceive such an Inequality, in case it had really existed. At present we measure the Duration of a Day by the Number of Oscillations, which a Pendulum of a given Length makes in this Space of Time: But the Ancients were not acquainted with these Experiments, whereby we might have been informed, whether a Pendulum of the same Length made as many Vibrations in a Day formerly as now. But even tho' the Ancients had actually made such Experiments, we could draw no Inferences from them, without supposing, that Gravity, on which the Time of an Oscillation depends, has always been of the same Force: But who will ever be in a Condition to prove this Invariability in Gravity? Thus, even supposing that the Days had suffered considerable Changes; and that Gravity had been altered suitably thereto, so that the same Pendulum had always completed the same Number of Vibrations in a Day; it would nevertheless be still impossible for us to perceive this Inequality, were it ever so great. And yet I have some Reasons, deduced from *Jupiter's* Action on the Earth, to think, that the Earth's Revolution round its Axis continually becomes more and more rapid. For the Force of

Jupiter

Jupiter so accelerates the Earth's Motion in its Orbit round the Sun, that the Diminution of the Years would be too sensible, if the diurnal Motion had not been accelerated nearly in the same Proportion. Wherefore, since we hardly at all remark this considerable Diminution in the Years, from thence I conclude, that the Days suffer much the same Diminution; so that the same Number will answer nearly to a Year.

XVII. *A Catalogue of the fifty Plants from Chelsea Garden, presented to the Royal Society, by the worshipful Company of Apothecaries for the Year 1748, pursuant to the Direction of Sir Hans Sloane, Bart. Med. Reg. et Societat. Reg. nuper Præs. by John Wilmer, M. D. Clariff. Societat. Pharmacut. Lond. Soc. Hort. Chelsean. Præfect. et Prælect. Botan.*

Read March 8. 1749 1301 **A** Butilon, Lavateræ flore, fructu cristato. *Hort. Elt.*

1302 *Acetosa rotundifolia repens Eboracensis, folio in medio deliquium patiente.*

1303 *Agrimonioides Column. Ec. 1. 145.*

1304 *Alyssum fruticosum Incanum. Turnfort.*

1305 *Ananthocyclus, coronopi folio. Vail.*

1306 *Anonis purpurea, spicata, alopecuroides major Boerh.*

- 1307 *Afarina* caule erecto ramoso, foliis oblongis acutis sessilibus, floribus erectis.
- 1308 *Astragalus annuus*, angustis floribus, pediculis longis. *T.*
- 1309 *Astragalus orientalis altiss.* Galegæ foliis. *T.* 602.
- 1310 *Astragalus luteus*, perennis procumbens vulgaris sive *Sylvestris*.
- 1311 *Brunella major*, folio non dissecto. *C. B.* 260. *Off.* 386.
- 1312 *Brunella folio laciniato.* *C. B.* 261.
- 1313 *Buglossum Creticum majus*, flore coeruleo purpurante. *H. R. Par.*
- 1314 *Campanula minor*, foliis incis. *H. L. B.*
- 1315 *Cataria minor Alpina.* *T. Inst.* 202.
- 1316 *Cerithe minor*, flavo flore. *C. B.* 258.
- 1317 *Chenopodio-morus minor.* *Boerb. Ind.* 91.
- 1318 *Cistus ladanifera Hispanica*, flore albo macula punicante insignito.
- 1319 *Commelina radice Anacampteoris.* *Hort. Elt. Tab.* 79.
- 1320 *Cornus foliis lanceolatis acutis subtus incanis, umbellis minoribus.*
- 1321 *Coronilla leguminibus teretibus articulatis erectis.* *Fl. Leyd.* 387.
- 1322 *Cynoglossum Creticum argenteo folio.* *C. B.*
- 1323 *Helianthemum foliis Sampfuchi, capitulis valde hirsutis.* *J. B.*
- 1324 *Hieracium amygdalas amaras olens, flore suave rubente.* *C. B.* 127.
- 1325 *Hypecoum latiore folio.* *T.* 230.
- 1326 *Jacea cinerea laciniata, flore purpureo.* *Triumfet.*
- 1327 *Jacea Spinosa Cretica.* *Zanon.*

- 1328 *Lathyrus tuberosus arvensis repens. C. B.*
 1329 *Lilium convallium, flore pleno variegato, Didac. T. 77.*
 1330 *Linaria triphylla minor, lutea, floris vexillo et calcari purpureo. B.*
 1331 *Malva Alexandrina Alchimilla folio. Sherard.*
 1332 *Malva, viscus arborefcens, flore miniato claufo. Hort. Elt.*
 1333 *Maurubiastrum limbo atro-purpureo, &c.*
 1334 *Mespilus Virginiana, Apii folio, vulgari fimilis, maior.*
 1335 *Mollugo foliis verticillatis, cuneiformibus acutis. Hort. Upsal.*
 1336 *Myagrurn, filiculis obverfe ovatis, lateribus depreffis. Fl. Lugd.*
 1337 *Myrrhis lutea daucoïdes. Mor. H. R. Bleff.*
 1338 *Ornithopodium portulacæ folio. T. 400.*
 1339 *Polygonatum caule purpurafcente. Raii Syn. 2. 148.*
 1340 *Primula veris flore rubro. Ger.*
 1341 *Pleudo-acacia. T. 649.*
 1342 *Rapiftrum maximum Cornuti. 147.*
 1343 *Reſeda foliis inferioribus integris, ſuperioribus laciniatis.*
 1344 *Sambucus folio laciniato. C. B. 456.*
 1345 *Sambucus humilis, ſive Ebulus. ib. Off. 180.*
 1346 *Scutellaria foliis cordato-lanceolatis, ferratis, pedunculis multifloris.*
 1347 *Sherardia Dillenii. Cat. Giſſ. p. 96.*
 1348 *Sonchus maritimus anguſtiſolius. C. B. P.*
 1349 *Trigonella leguminibus pedunculatis congeſſis, &c. Hort. Upsal.*
 1350 *Viola Martia arborefcens purpurea. C. B. 199.*

XVIII. *An Account of a surprising Inundation in the Valley of St. John's near Kewick in Cumberland, on the 22^d Day of August 1749, in a Letter from a young Clergyman to his Friend; communicated by John Lock, Esq; F. R. S.*

Feb. 12. 1749.

S I R,

Read March 15. 1749. **I**N order to give you a distinct Answer to your Queries in relation to the Inundation at *St. John's*, I took a Ride to the Place to satisfy myself of the Matter of Fact, because the Accounts which were given me were very different.

This remarkable Fall of Water happened at 9 o'Clock in the Evening, on the 22^d of *August* last, in the Midst of the most terrible Thunder, and incessant Lightning, ever known in that Part in the Memory of the oldest Man living, the preceding Afternoon having been extreme hot and sultry. And what seems very uncommon, and difficult to account for, the Inhabitants of the Vale, of good Credit, affirm to have heard a strange buzzing Noise like that of a Malt-mill, or the Sound of Wind in the Tops of Trees, for two Hours together, before the Clouds broke.

I am not so much a Philosopher as to find out what could occasion such a vast Collection of Clouds or Vapours, particularly at that Time and Place; but am satisfy'd from the Havock it has made in so short a time (for it was all over in less than two Hours),
that

that it must have far exceeded any Thunder-shower that we have ever seen. Most probably it was a Spout or large Body of Water, which, by the Rarefaction of the Air, occasioned by that incessant Lightning, broke all at once upon the Tops of these Mountains, and so came down in a Sheet of Water upon the Valley below.

This little *Valley of St. John's* lies East and West, extending about three Miles in Length, and half a Mile broad, closed in on the South and North Sides, with prodigious high, steep, rocky Mountains: Those on the North Side, called *Legburthet Fells*, had almost the Whole of this Cataract; for I do not find that any remarkable Quantity of Water was observed from those on the South, notwithstanding the Distance from the Tops on each Side cannot be a Mile. It appears likewise, that this vast Spout did not extend above a Mile in Length; for it had Effect only upon four small Brooks, which come trickling down from the Sides of the rocky Mountains. But no Person, that does not see it, can form any Idea of the ruinous Work occasioned by these Rivulets at that time, and (what seems almost incredible) in the Space of an Hour and half. At the Bottom of *Catchetv Gill*, which is the Name of the greatest, stood a Mill and a Kiln, which were entirely swept away, in five Minutes time, and the Place where they formerly stood, now covered with huge Rocks, and Rubbish, 3 or 4 Yards deep. One of the Mill-stones cannot be found, being covered, as is supposed, in the Bottom of this Heap of Rubbish.

In the Violence of the Storm, the Mountain has tumbled so fast down as to choak up the old Course
of

of this Brook; and, what is very surprising, it has forced its Way through a shivery Rock, where it now runs in a great Chasm, four Yards wide, and betwixt eight and nine deep.

In the Course of each of these Brooks, such monstrous Stones, or rather Rocks, and such vast Quantities of Gravel and Sand, are thrown upon their little Meadow-fields, as render the same absolutely useless, and never to be recovered.

It would surpass all Credit to give the Dimensions and Weight of some Rocks, which are not only tumbled down the steep Parts of the Mountains, but carried a considerable Way into the Fields, several thrown upon the Banks larger than a Team of ten Horses could move. Near a Place called *Lob-wath*, I had the Curiosity to measure one carried a great Way, which was 676 Inches, or near 19 Yards about.

The Damage done to the Grounds, Houses, Walls, Fences, Highways, with the Loss of the Corn and Hay then upon the Ground, is computed variously, by some at 1000*l.* by others at 1500*l.*

One of these Brooks, which is called *Mose or Mosedale Beck*, which rises near the Source of the others, but runs North from the other Side of *Legburthet Fells*, continues still to be foul and muddy, having, as is supposed, worn its Chanel so deep in some Part of its Course as to work upon some mineral Substance, which gives it the Colour of Water hushed from Lead-mines, and is so strong as to tinge the *River Derwent* (into which it empties itself) even at the *Sea*, near 20 Miles from their Meeting.

These

These are most of the Particulars I could collect concerning this wonderful Inundation. I shall only add *Mr. N.'s Philosophical Account to his philosophical Friend.*

S I R,

“ *Tuesday August 22. 1749.* was the best Hay-day
 “ we had here that Season, but at Eight o’Clock
 “ at Night it began to Thunder, first Westwards
 “ from *Cockermouth*, then in a few Minutes East-
 “ wards from *Penrith*. These Thunder-clouds,
 “ with equal Force, and contrary Direction, met
 “ together upon the Mountains above the Valleys
 “ of *St. Johns* and *Threlkeld*, as at or about the
 “ *Great Dod* and *Cova Pike*, and must of conse-
 “ quence hover on or about them, and thereon
 “ vent *Water-spouts* (but not so on the Valleys,
 “ otherwise than by the violent Course of the
 “ Brooks and Rivulets, from the one down to the
 “ other); which would increase and perpetuate the
 “ Lightning, so swift in Motion, and visible to our
 “ Eyes, but retard and obstruct the Undulations of
 “ the Air, which are far more slow in Motion, and
 “ later in coming to our Ears.---For any two such
 “ Bodies as thick Clouds, driven by contrary Winds,
 “ and meeting together with equal Force, and con-
 “ trary Directions, cannot impel each other back-
 “ wards or forwards, but must remain at or about
 “ the Place where they met, and there exert their
 “ Vigour: which, in this Case, must be the Reason
 “ of such Water-spouts upon these Mountains, and
 “ not in the Valleys; and also why the Sight of
 “ the

A a a

“ the Lightning was more terrible to our Eyes than
 “ the Sound of the Thunder to our Ears.---Like to
 “ this is the Case of *Whirl-puffs*.”

Tours, &c.

J. R.

XIX. *An Account of an extraordinary Fire-ball bursting at Sea, communicated by Mr. Chalmers.*

Read March 22. 1749. **N**OVEMBER 4. 1749. in the Latitude of $42^{\circ} 48'$ Longitude, $09^{\circ} 03'$ the Lizard then bore, N. $41^{\circ} 05'$ about the Distance of 569 Miles. I was taking an Observation on the Quarter-deck, about ten Minutes before 12 o'Clock: One of the Quarter-masters desired I would look to Windward, which I did, and observed a large Ball of blue Fire rolling on the Surface of the Water, at about Three Miles Distance from us: We immediately lowered our Topsails, and had our Fore and Main Clew-Garnets manned to haul up our Courses; but it came down upon us so fast, that before we could raise the Main Tack, we observed the Ball to rise almost perpendicular, and not above forty or fifty Yards from the Main Chains: It went off with an Explosion as if Hundreds of Cannon had been fired at one time; and left so great a Smell of Brimstone, that the Ship seemed to be nothing but Sulphur. After the Noise was over, which I believe did

did not last longer than half a Second ; we looked over head, and found our Maintopmast shattered into above an hundred Pieces, and the Mainmast rent quite down to the Heel. There were some of the Spikes, that nail the Fifth of the Mainmast, drawn with such Force out of the Mast, that they stuck in the Main Deck so fast, that the Carpenter was obliged to take an Iron Crow to get them out : There were five Men knocked down, and one of them greatly burnt, by the Explosion. We believe, that when the Ball, which appeared to us to be of the Bigness of a large Millstone, rose, it took the Middle of the Main Topmast, as the Head of the Mast above the Hounds was not splintered : We had a very hard Gale of Wind, from the N. by W. to the N. N. E. for two Days before the Accident, with a great deal of Rain and Hail, and a large Sea : From the Northward we had no Thunder nor Lightning, before nor after the Explosion. The Ball came down from the N. E. and went to the S. W.

This Account was given by Mr. *Chalmers*, who was, when the above-mentioned Accident happened, on board his Majesty's Ship the *Montague*, under the Command of Admiral *Chambers*.

XX. *Extraët of a Letter from the Abbé Nollet, F.R.S. &c. to Charles Duke of Richmond, F. R. S. accompanying an Examination of certain Phænomena in Electricity, published in Italy, by the same, and translated from the French by Mr. Watſon, F. R. S.*

Paris, March 5. 1750.

May it please your Grace,

Read March
29. 1750.

IF your Grace ſhall have done me the Honour to have peruſed the Treatiſe I ſent, intituled, *Recherches ſur les Cauſes particulieres des Phenomenes electriques*, your Grace will have ſeen my Doubts touching the Reality of certain Facts publiſhed in *Italy*, and which have not ſucceeded any-where elſe. I will not diſſemble, that the Deſire of knowing how far theſe Things were true, has been one of the principal Motives of my Journey; and if your Grace has been deſirous to have learned the Fruits of my Inquiries in this reſpect, you need only look over the Memoir ſent herewith, which I beg your Grace afterwards to preſent to the Royal Society. I well know how much that learned Body intereſts itſelf in relation to the Subject of this Memoir; and, as one of its Members, I think it my Duty to communicate the Reſult of my Labours. As I correſpond with Mr. *Watſon*, who is well verſed in theſe Matters, it may not be diſagreeable to him to put theſe Papers in a Condition to be laid before the Royal Society. I have

have made the whole Tour of *Italy*, which has enabled me to make many Observations relating to Natural Philosophy. I have made some Experiments at the *Grotto del Cani*, near *Naples*, which take off a good deal, in my Opinion, of the Marvellous of that famous Phenomenon. I propose to myself the Honour of transmitting them upon some future Occasion, as my Letter is already too long. The Eruptions from *Vesuvius* were very great when I was there, and were the Prelude to three Earthquakes, which happened just after my Departure, and which I was fortunate enough not to be Witness of. The *Lagunes* of *Venice*, and the Waters of the *Mediterranean* Sea, appear luminous every-where in Summer, in dark Nights: I have discovered, that this Light proceeds from a very small Insect, which multiplies prodigiously. I have heard all my Life, that the Water of the Ocean appears sometimes luminous: It may possibly proceed from the same Cause, and I should be very glad of a particular Inquiry into this Fact. I have the Honour to be, with the most inviolable Attachment,

My Lord Duke,

Your Grace's

Most humble and obedient Servant,

THE ABBÉ NOLLET.

An Examination of certain Phenomena in Electricity, published in Italy, by the Abbé Nollet, Fellow of the Royal Society, of the Royal Academy of Sciences at Paris, and of the Academy del Instituto at Bologna, communicated to the Royal Society by his Grace Charles Duke of Richmond, &c. F. R. S. Translated from the French by W. Watson, F. R. S.

ELECTRICITY, after having excited every-where the Emulation of the Ingenious, after having filled us with Wonder by an infinite Number of Phenomena more singular and more admirable one than another, seems, within these few Years, to have shewn itself equally surprising, but more useful, in *Italy*, than it had done in *England*, *France*, *Germany*, &c. where, for these twenty or five-and-twenty Years, so great a Progress had been made. We have heard of nothing less than the Cure, or the almost sudden Relief, of Distempers of every Kind, and of purging all Sorts of Persons in a manner of all others the most proper to avoid the Repugnance and Disgust we naturally have to medical Potions. Even that Disease which we are most desirous of concealing, was not by these means without its Remedy; the Mercury being volatilized, and carried, by the electric Matter, into the Body of the Patient, tinged his Skin of a leaden Colour, and procured him a certain Cure by a copious Salivation.

The Manner in which this was done was not less to be wondered at than the thing itself; Persons afflicted with inveterate Gouts, Rheumatisms, Fluxions, Tumours, &c. were relieved therefrom

by being electrized for a few Hours, and often a less Time was sufficient. Sometimes the rubbing a Glass Tube only, or at other times a Glass Tube lined with some Medicine appropriated to the Disease of the Patient, was employed. These Medicines, to exert their Operation upon the Patient, passed thro' the Glass; and this they were very certain of, as they saw them sensibly diminish in their Quantity, although the Glass containing them was stopped as close as though sealed hermetically. To promote Stools, it is only necessary that a Person should be electrized for six or eight Minutes, holding in his Hand a Piece of Scammony or Gamboge; the Effects were as certain, as though these Drugs were taken internally. Besides, if a Person was desirous of being perfumed from Head to Foot, nothing more was necessary than being electrized with a Glass Vessel lined with Balsam of *Peru*, *Benjamin*, or some such Drug; and from this Electrization the Odours were perceptible for two or three Days, even so much as to incommode those to whom these Smells were disagreeable.

Effects no less wonderful than these were published every Day, by Writings printed, and printed again*,
or

* The first of these Works is a Letter of *M. Pivati*, an Advocate at *Venice*. It was first printed at *Lucca* in 1747. and some time after reprinted at *Venice*, always with the same Title, *Della Elettricità, Lettera del chiarissimo Signor Francesco Pivati, &c.* This Letter was translated into *French*, and printed at *Paris*. In 1748. there appeared another Treatise, printed at *Bologna*, intituled, *Osservazioni fisico-mediche intorno alla Elettricità, da Gio. Giuseppe Verati publ. profess. nella università e nella Accademia delle Scienze del istituto academico Benedettino.* In the same Year 1748. there was printed at *Verona* a
little

or by particular Letters and Memoirs in Manuscript addressed to the Ingenious all over *Europe*. They were also confirmed by respectable Witnesses, and by such as were capable of imposing them upon Persons the most guarded against the Exaggerations, which never fail accompanying the Relations of interesting Novelties.

The Importance of the Facts themselves, and the Appearance of Authenticity which attended them, demanded that they should be considered; and indeed they roused every-where the Attention of those Philosophers, who had for any time turned their Thoughts to these Enquiries. Every one of them was desirous of repeating what Mr. *Pivati* said had been done at *Venice*, Mr. *Verati* at *Bologna*, and Mr. *Bianchi* at *Turin*; and to begin them, as the Experiment seemed more simple, they attempted at first the Transmission of odoriferous Substances through the Pores of the Glass, the first Foundation of *Intonacatores*†, so called by Mr. *Pivati*; and which we shall, in the Progress of this Paper, call medicated Glasses; and they

little Treatise concerning medical Electricity, intituled, *Lettera del Signore Canonico Brigoli sopra la Macchina Elettrica*. Afterwards, in 1749 there was published at *Venice* a new Treatise, considerably larger than the first, in which we find not only the Author's own Experiments, but also those of Mr. *Bianchi* of *Turin*, and of some other Persons who had taken Pains with this View. This last Work is intituled, *Rassegna fisica sopra la Medicina Elettrica*. It is principally in this Volume that the Facts of which we are now treating are mentioned.

† Mr. *Pivati* has given this Name to the manner in which he prepares hollow Cylinders of Glass in filling them, or lining them, with some Drug, the Virtue of which, he pretends, will transude with the electric Matter.

they endeavoured to purge Persons of all Ages, and of both Sexes, by making them hold in their Hand, while they were electrized, Scammony, Gamboge, Aloes, and such-like. But it was very extraordinary, that of all the Persons who were engaged in these Experiments, no one could succeed; and, from a sort of Shame, each of them expected, that some one would complain of his Want of Success: But this was retarded, as yet, by the Haste with which Mr. *Winkler* * sent to the Royal Society, and to some ingenious Men in *France*, the Result of his own Experiments, which well agreed with those of *Italy*, and upon the Credit of which he had made them.

For my own Part, I will speak without any Restraint: When I found my Attempts were fruitless, I without any Difficulty communicated it to all the Philosophers with whom I corresponded: I desired them to let me know if they had been more successful than my myself, and to acquaint me how they had proceeded, that I might conform myself thereby. I was much more willing to confess my Inability, and to learn from others the Method which must of Necessity be observed, than to be deprived longer from seeing those Phenomena which ought to result therefrom. Instead of Instructions, which might conduct me to the Success I wanted, I received nothing but such Confessions as mine: From these I saw, that all Methods had been tried; and that nothing remained to be done, but either to believe every thing upon the Faith of others, or to doubt, without Hopes

* A celebrated Professor of Philosophy at *Leipsick*, who has written a good deal concerning Electricity.

Hopes of being better informed. The first of these two Cases was directly opposite to the Law I had determined to abide by, when I first engaged in the Study of experimental Philosophy; and the other was putting a great Violence upon myself. But from this Moment I formed my Project of travelling; and, among the different Motives which made me undertake the Journey to *Italy*, I must confess one of the most pressing was, the Desire of seeing succeed, in the Hands of those who had said they had, those Phenomena in Electricity, towards the Verification of which I had made so many fruitless Efforts. I formed to myself a great Pleasure in seeing Balsam of *Peru*, *Benjamin*, *Camphire*, *Cinnamon*, &c. pervade an electrized Glass, which I had taken care to stop myself; to see People purged by the Palm of their Hands; to see an old gouty Man, as the Bishop of *Sebenico**, clap his Hands together, strike the Ground with his Feet, and walk freely, after an Electrization of two Minutes: But what still more piqued my Curiosity was, to learn, if possible, why the *Italian* Electricity should enjoy these Prerogatives, to the Exclusion of that of every other Country. If this Singularity was as real as it appeared to be, it was a new Wonder more difficult to be explained than any other; and of which I proposed to study attentively the Circumstances, to endeavour to find out the Cause.

If I have had the Trouble of passing the *Alps*, to search out the Truth, it is neither to conceal it, nor yet less to disfigure it with Falshood; and I will re-

* See Mr. *Pivatti's* Letter, printed at *Lucca*, p. 37.

late, with a Liberty truly philosophical, all that I have heard, and all that I have seen: But if, in doing this, I shall find myself obliged to contradict some of the Facts published by some Persons known in the Republic of Letters, I protest that it is without Prejudice, on my Part, to the advantageous Idea I may have of their Candour or Abilities; and I sincerely wish, that the Reader may consider them in the same manner. If he is judicious, he will willingly concur with me; because, in an Enquiry so obscure as this of which we are now treating, an ingenious Man, with a very just Intention, may take what is false for that which is true.

I arrived at *Turin* about the Beginning of *May* 1749. and one of my first Cares was, to visit Mr. *Bianchi*, a celebrated Anatomist, and the first Author of purging by Electricity. I related to him all that he had written to me upon this Subject; and I begged of him, that all the Experiments, which had neither succeeded with me, nor a great many others, might be repeated between us, and under his Direction. His Complaisance easily granted what I desired: We set about it; and Pere *Garro*, a *Minim*, and Professor of Philosophy in the University, caused to be carried to the Place where we determined to make our Experiments his electrifying Machine; which is exactly like that which I have described in my Essay, *Page* 19. *Fig.* 2.

The Experiments of the First Day.

Upon the 21st of *May*, about Four o' Clock in the Afternoon, the Weather cool, but uncertain, Mr. *Bianchi* having procured a Lump of Scammony, and

another of Gamboge, each of which was about the Size of an Hen's Egg; I took the former in my Right-hand, and having applied my Left near the Surface of the Glass Globe, and standing upon a Cake of Resin, I was electrized fifteen Minutes without Interruption. This Day the Electricity was indifferently strong.

After me, a young Man, aged Twenty-two, and of a pale Complexion, was electrized; whom, a few Days before, I had taken into my Service.

They then electrized a young Woman of about Sixteen or Seventeen, of a weakly Constitution; but who, at that time, was tolerably well.

After that M. *Beccari*, Professor of Philosophy in the University, aged about Thirty-five, of a dry Habit, was electrized.

They then electrized a Servant belonging to the House where they made the Experiments, aged about Twenty-four, who did not appear to be indisposed.

They also made the same Experiment upon another Servant, a strong Man of Forty, or thereabouts; and each of these Persons was electrized the same time as I had been; that is, fifteen Minutes successively.

I did not perceive in myself any Effect, which I could attribute to the Electricity; no extraordinary Motion or Pain in my Bowels; and it was the same with M. *Beccari*, with the Servant aged Forty, and with the young Woman.

But the young Man of Twenty-two, being interrogated after the others, said, that he had had in the Night two Stools, and some Complaints of the Colic. The Servant of the House, who was asked the same Questions, declared, that he had had a very large Stool, as though he had taken a Purge.

These

These two last Depositions were, as the others, taken upon the Spot; and I began to consider them as important, when I learned, from the Confession of the last, that he had taken, for some Days, a Decoction of wild Succory, for an Indisposition which he had not spoke of till then. The young Man who said he had had two Stools, rendered his Testimony more than suspicious, by certain Singularities* which he was desirous of adding some Hours after; and since that time he has conducted himself in such a manner, as to prevent my having any Confidence upon what he said.

What I have just now mentioned to have found in these two Servants, one of which kept me ignorant some time of his having taken Broth with Succory; and the other having testified such a Love for the Marvellous, that one ought in Prudence to suspect every thing he said; This, I say, made me very delicate in the Choice of the Persons who I was desirous should be admitted to our Experiments. I declared that I was not willing to receive thereto either Children, Servants, or People of the lower Class; but only that reasonable People should be admitted, and of an Age sufficient to leave nothing to be feared of the Truth of what they might depose.

The

* This young Man made himself very happy in relating to every body, that he had been electrized; and that he had been purged thereby, as though he had taken Physic: And added, that, an Hour after his Electrization, having had the Curiosity of visiting his Wife, to see what would be the Consequence, he had communicated this electricity to her, and that she had been purged as well as himself.

The Second Experiment.

The Day after we had made our first Set of Experiments I was again electrized fifteen Minutes successively, as I had been the Day before, holding in my Hand a large Piece of Scammony; and after me there went successively through the same Trial Dr. *Scherra* a Physician, Mr. *Verne* Demonstrator of Anatomy, the Marquis of *Srié*, the Abbé *Porta* a Professor in the University, the Preceptor to the Children of the Marquis *D'Ormea*, and the Preceptor to the young Messieurs *D'Osa*. This Day the Electricity was indifferently strong.

Of all these Persons who were electrized, not one felt any Pains in his Belly, no one had any Evacuation which could be attributed to the electrical Power; but to say scrupulously all that came to my Knowledge, after several Questions, the Preceptor to young Messieurs *D'Ormea* declared, that he had parted with more Wind than he had usually done, and he believed also with more Urine. Thus of seven Persons there was but one who suspected the Operation of Electricity to have had any sensible Effect upon him, and this Suspicion, as we see, was a very slight one.

The Third Experiment.

The 23^d of May, the Electricity being more strong than the preceding Days, we chose a Piece of new * Scammony, very strong in its Flavour, and
which

* M. *Bianchi* suspected, that the Drugs we had made use of in our first Experiments had lost their most subtle Parts, only capable, as he said, of being introduced with the electric Matter.

which weighed four Ounces: The Marquis *D'Ormea*, Dr. *Allion*, a Physician, the two above mentioned Preceptors, Pere *Garò*, Count *Ferrero*, and myself, held, one after the other, this Piece of Scammony, and each was electrized fifteen Minutes, as had been done in the former Experiments.

Two Days passed, and absolutely none of these Persons perceived any thing, that could be attributed to the Electricity.

The Fourth Experiment.

The same Day we endeavoured to repeat an Experiment, which M. *Bianchi* had wrote me word of some Months before, and which had not succeeded with me at *Paris*. This Experiment was the Transmission of Odours along a Chain, or an iron Bar electrized. One of us prepared and applied a little Piece of Linen, covered with Balsam of *Peru*, upon the iron Bar, which received the Electricity from the Globe: We fastened to this Rod the End of an iron Chain, which was electrized by Communication; and we expected, that the Odour of the Balsam would be transmitted to the other End of the Chain, to which was hung a Ball of Metal. But this was expected in vain; nobody could perceive the slightest Sign of this Transmission.

M. *Bianchi*, seeing, as I did, that the Result of all these Experiments did not agree with those, which he had believed to have taken place before, told me, that this Difference might arise from our having employed an Electricity too strong: because that which he had experienced with Success had always appeared more weak. I submitted to this Reason,

Reason, having no other to give him more plausible ; and to bring the whole Operation, as near as might be, to its first Circumstances, we met together, to the Number of fourteen, at M. *Bianchi's*, where we were expected ; and we were electrized, one after the other, by him, as long a time as he judged proper, sometimes with Scammony, and sometimes with Gamboge, which he himself had chosen.

The Machine used this Day was the same, with which M. *Bianchi* had always made his own Experiments. It consisted of an hollow Glass Cylinder, three Inches in Diameter, and something more than half a Foot in Length *, mounted between two Supporters upon a Board, which was fastened to a Table with Screws. This cylindrical Vessel was turned round, without any other intermediate Apparatus, by an Handle, which was at least four Inches in its Radius ; so that the Hand, by which this Machine was turned, revolved with greater Velocity than the Surface of the Glass Cylinder, which was thereby put in Motion.

This Machine had this Convenience, that one Person only might turn the Handle with one Hand, and rub the Surface of the Glass Vessel with his other : But there is no Difficulty in comprehending, that the Electricity could not but be always very weak with such a Cylinder, and from such Friction ; so that, in the Experiments of this Day, we were scarce able to perceive any Snaps, in touching the iron Chain, by which the Electricity was com-

communicated, or from the Person electrized ; but this was precisely what was desired.

These Experiments were made on *Thursday, May 29*, between Four and Six o'Clock in the Afternoon, in a very hot and serene Day : on *Sunday* Evening, all the Persons who had been electrized, being interrogated, answered without Hesitation, and in a manner absolute in all respects, that they had perceived nothing which could be attributed to these Experiments : these Persons were the Marquis *de Siria*, Count *Ferrero*, the Marquis *D'Ormea*, Monsieur *de Tignola*, an Officer of Artillery, Pere *Becari*, Pere *Garo*, Dr. *Allion*, Monsieur *Verne*, Dr. *Scherra*, the Abbé *Porta*, the two Preceptois, the young Woman, whom I mentioned before, and myself.

The Night following, that is to say, that between *Sunday* and *Monday*, I was troubled with an Indigestion, and felt Pains of the Colic ; but I attributed them much less to the being electrized the preceding *Thursday*, than to some Roots I had eaten the Day before at Dinner, and to a very large Glass of iced Lemonade, which I had drank some time after, and contrary to my usual Custom. Nevertheless, as some Persons were desirous of saying, that the electrizing had purged me, and that I had not the Candour to speak of it, I thought it my Duty to add here for my Justification, that during my whole Life I have had a weak Stomach ; that I could never take Ice, nor Liquors very cold, without a good deal of Circumspection, and always at the Hazard of being incommoded therefrom ; and that these Roots, which are called *Ravanelle* in

Piedmont, notwithstanding my Attention to eat sparingly of them, had oftentimes disturbed my Digestion, during my Stay there, and at times when I had no Concern in electrical Experiments. Besides, the not being incommoded for three Days, and more, was sufficient to prevent my attributing what happened to me to the electrical Power.

The extreme Circumspection, with which I was desirous of choosing the Persons for all our Experiments; the Difficulty of procuring and moving such sick People, who were in a Condition and Disposition to leave nothing to be feared on their Parts from their Prejudice, and their heated Imagination; that of reconciling my Time with that, which a Physician of great Practice could grant me; these Obstacles, I say, prevented my attempting with M. *Bianchi* such Cures, as he believed to have been brought about by means of the electric Virtue, either by its own Action, or by joining thereto Medicines appropriated to the Condition of the Sick, and contained in Glass Vessels electrized by Friction. But I testified a great Desire of seeing those Persons who had been cured, or considerably relieved, by this Method before this time. I asked, for this Purpose, the Gentlemen of the Profession, who had been Witnesses of the Experiments, and who were yet in a Condition of seeing every Day some of the Persons, cited in a Manuscript which I had of M. *Bianchi's*; and of whom the exact History is mentioned in the ninth Chapter of a Treatise of M. *Privati* *: I went myself to the Shoemaker, in whose

* *Riflessioni fisiche sopra la Medicina elettrica*, p. 149.

whose Shop the young Man of twenty one Years of Age worked, mentioned in the 110th Page of the above Treatise, and in Page 419 of my *Recherches* *. The Obligation of saying the Truth, to which Philosophers ought to sacrifice every human Regard, will not permit me to dissemble that my Enquiries made with all possible Diligence, and without any other Interest than that of knowing the Truth, have made me see sufficiently clear, that these Facts have been greatly exaggerated. I am willing to believe, that it is the Fault of the Sick, who, being prejudiced perhaps by too great Hope, and possessed by a kind of Enthusiasm, have said themselves, and made others believe, more than really was the Case. One might have Examples enough to cite of such Illusions; but be that as it will, I cannot help believing, that a great Part of the electrical Cures of *Turin* have been no other than temporary Shadows, which have been taken with a little too much Precipitation, or Complaisance, for Realities.

I carried with me to *Venice* the same Curiosity, and the same Desire of being instructed, upon the Subject of the Transmission of Odours from medicated Tubes, and of the Cures, or of being relieved from Disorders almost suddenly, by the electrical Power. One of my first Cares was, to find out some Friends or Acquaintance of M. *Pivati* to acquaint him of my Arrival, and to obtain of him the Favour of being admitted into his Laboratory ;
and

* They have translated *Hatter*, instead of *Shoemaker*, in taking the Italian Word *Calceario* for that of *Calzolaino*, which was sufficiently legible in the Manuscript.

and that he would have the Complaisance to satisfy my great Desire of seeing him cause Odours to pervade the Sides of a well stopped Glass, or by electrifying to diminish sensibly any Substance therein contained. Mr. *Angelo Quirini*, a *Venetian* Gentleman, a great Friend to the Sciences, and one always ready to assist those who apply themselves thereto, did me this Service among many others, for which I am indebted to his Friendship and Politeness. He accordingly acquainted M. *Pivati*; and on the 1st of *August*, 1749. we waited upon him, and found there a large Company, among which were several Persons of Distinction: Among others were Mr. *Antony Mossinigo*, heretofore Embassador in *France*, Abbé *Horter*, &c. At the Sight of this great Assembly I believed (and I had some Reasons for believing it) that my Curiosity had been * suspected of Disbelief, and of an Obstinacy to doubt; this Company therefore was called together to be an Evidence of my Conviction. I would have been willing to have bought at this Price the Pleasure of seeing a Phænomenon, for the verifying of which I had taken so much fruitless Trouble. The manner of making it succeed had been without doubt some Novelty to me, as curious itself as the Effect which should have resulted therefrom. But how great were my Surprise, and my Regret, when M. *Pivati* declared

* I had been acquainted, that my Arrival at *Venice* had been notified by Letters from *Turin*, which had described me as a Man so prejudiced against Facts, that the strongest could not make me believe. In this they did me great Injustice; unless they took for Incredulity on my Part the Precaution I took, against Illusion, and false Appearances.

declared frankly to me, in the Presence of this whole Company, that he would not attempt to shew me the Transmission of Odours; that that Phenomenon had not succeeded but once or twice, as he had said in his first Letter printed at *Lucca*, although since that he had made many Attempts to repeat that Experiment, with the same as well as with other Glasses; that this Cylinder had been since broke; and that he had not so much as kept the Fragments of it!

But at least, I told him, I might see him use one of his medicated Tubes, and weigh it before and after electrifying, to see, with him, the included Matter diminish sensibly. This Fact, he told me, had succeeded with him a great many times; but that now there was too much Company; that it was too hot, and, in consequence, that the Electricity would be too weak for it. He might perhaps be in the Right: But why did he call together so numerous a Company?

I then asked him concerning the Cures related in his Works, and especially concerning that of the Bishop of *Sebenico* *. He avowed to me (and in Part I knew it already), that the Prelate was not cured; and that, since the Electrification, he had been as he was before.

I took my Leave of M. *Pivati*, and acquainted him, that I proposed to continue about a Week in *Venice*; and I very earnestly begged of him to collect together his best Vessels, to renew the Substances therein, and to let me know, that, if they succeeded, I might wait upon him, that I might be able to publish

lish them as an Eye-witness; and I spoke to him with a good deal of Sincerity. M. *Pivati* promised me he would; but, as I heard nothing from him afterwards, I presume that he had nothing to shew me.

Dr. *Sommis*, of the Faculty of Physic at *Turin*, being at *Venice* a little while after me, had also the Curiosity of visiting M. *Pivati* in *August* last, and to see, under his Management, the Effects attributed to the medicated Tubes. The following is the Letter* he wrote me upon this Subject, *Nov. 15. 1749.*

“ Here is, kind Sir, in a few Words, the Account of what I observed in *Venice*, at Signor
 “ *Pivati*’s, during the Month of *August* last. The
 “ 25th Day, after Dinner, he electrified me, making use of a Tube of the Length of about five
 “ Inches, and a little more than two in Diameter,
 “ causing me to hold in my Hand an Ounce of
 “ Scammony. There were present at this Experiment his Excellency the Abbate *Barbarigo*, the
 “ Fathers *Bertinelli* and *Magrini*, Jesuits, Dr. *Grampini*, and several other Persons. I found not any
 “ Change in myself either that Evening or the following Day. The 29th of the same Month I
 “ returned again to Signor *Pivati*, where I found a
 “ Gentleman of the House of *Soranzo*, two Spanish
 “ Officers, two other *Venetian* Gentlemen, a Physician, and some others; and he caused a Tube to
 “ be lined [or plastered within] for the Experiment,
 “ which was represented by him in a dangerous
 “ Light; but which was not such however as to hinder
 “ my telling him, that I desired that the Experiment
 “ might

* This Letter is translated from the *Italian*.

“ might be made upon myself. He began then to
 “ electrize me at 35 Minutes after Five in the After-
 “ noon, and made an end, because the Line of the
 “ Wheel tangled, at 57 Minutes after Five. Having
 “ then new-fitted the Line, he began again at five
 “ Minutes after Six, and continued till 14 Minutes
 “ after, making again this time the Sparks to issue con-
 “ tinually from my Forehead. This Tube was nearly
 “ of the same Length and Size as the former. The Ex-
 “ periment being over, I then prayed him to tell with
 “ what Materials the Tube had been lined; and so
 “ much the rather, as he had let fall in Discourse with
 “ the *Spanish* Gentleman, that they might have seen
 “ me sleep; and he answered me, that the Tube was
 “ lined with two Ounces and six Drams of Flowers of
 “ *Benjamin*, and two Drams of *Opium*. Having heard
 “ him mention the *Opium*, I prayed him to take
 “ the Trouble of making another Experiment, his
 “ Excellency Signior Abbate *Pietro Barbarigo*, and
 “ myself also, having with us an Ounce and Half of
 “ *Opium*; and he complied with my Desire. He
 “ therefore electrified his Excellency, making him
 “ hold the *Opium*, that is to say, the Quantity of
 “ half an Ounce of it, in his Hand, and the Sparks
 “ issuing from his Hand for half an Hour toge-
 “ ther, beginning at 18 Minutes, and finishing at 48
 “ Minutes, after Six. In this second Experiment he
 “ made use of the same Tube which he had used the
 “ *Monday* before, the 25th of the same Month: But
 “ neither his Excellency nor I slept more than ordi-
 “ nary. These are the Experiments which I made
 “ at *Venice* with Signor *Pivati*. In my Return
 “ home, passing thro’ *Placentia*, I here spoke with
 Dr.

“ Dr. *Cornelius*, who assured me, in Presence of
 “ Dr. *Riviera*, that he also had tried a great many
 “ times to purge others by electrifying them ; but
 “ that it had never succeeded with him but once,
 “ which was upon a Maid-Servant, to whom he had
 “ given some Rhubarb to hold in her hand. Not-
 “ withstanding which, finding it never to have pro-
 “ duced the same Effect in any other Person, it ra-
 “ ther seemed to him, that some other Cause might
 “ have occasioned what happened to his Maid.
 “ Please to let me know, if in any thing else I can
 “ obey your Commands, and you shall ever find me
 “ ready, to the best of my Ability,” &c.

We see then from this Letter, and from the Ac-
 count I have before given of my Visit to M. *Pivati*,
 that I have not been able to verify at *Venice* any of
 those Facts, in which my Curiosity was interested.
 I might add also (and I ought, without Doubt, since
 I have engaged to mention exactly every thing I have
 been able to find out from my Enquiries upon this
 Subject), that of all the Persons of the Country,
 who have been with M. *Pivati*, to be certified of
 the Truth of his Experiment from ocular Demon-
 stration, and whom I was able to interrogate, I found
 but one who attested them, as having seen them :
 This was a Physician, a Friend of M. *Pivati*, whom
 I found at his House, and who had, as he said, al-
 most always assisted him in his Experiments.

From *Venice* I went to *Bologna*, where I became
 acquainted with Dr. *Verati*, a Member of the Aca-
 demy *De l'Institut*. From the frequent Conversa-
 tions I had with him, I was convinced that he was a
 learned, wise, and candid Man, as I had heard before.

I laid before him, without Scruple, the Doubts I had, touching the Transmision of Odours, the Effects of lined Tubes, purging by electrizing, as well as the almost sudden Cures.

Dr. *Verati* answered me, first, " That he had
 " made many Experiments, from the Result of which
 " it seemed to him, that the Odour of Balsam of
 " *Peru* pervaded from within to the Outside of a
 " Glass Cylinder which he shewed me." This Tube
 however, at this time, would not convince us of its
 having been done, although we rubbed it with our
 Hands very strongly. But upon my representing to
 him, that as the Glass was closed only with wooden
 Stoppers, which could be taken off at Pleasure, to
 put in or take out the odoriferous Substances, it
 might happen, that the Odours, agitated by the
 Heat, might have passed through the Pores of the
 Wood; he answered me, " That this was possible;
 " and although Appearances had inclined him to be-
 " lieve the Transmision of these Odours through
 " the Pores of the Glass, he had nevertheless sus-
 " pended his Judgment upon this Effect, as well as
 " upon that from lined Tubes, until new Proofs,
 " made with more Precaution, shou'd have entirely
 " dissipated his Doubts. Secondly, with regard to the
 " Purging by Electricity, he had in his House a Man
 " and Maid-Servant, who had been purged in this
 " manner: That at least these two Persons had felt
 " the same Effects as though they had taken Physic;
 " after having been electrized in M. *Bianchi's* man-
 " ner: That this Effect having no other apparent
 " Cause than the preceding Electrization, *the great*
 " *Number of Facts of this kind, which had mani-*
 D d d " *fested*

“ *fested themselves at Turin*, had determined him
 “ to believe, that what happened to his two Ser-
 “ vants was the natural Consequence of this Electriza-
 “ tion : That, with regard to the rest, he proposed
 “ to try the Experiment again upon a sufficient
 “ Number of Persons of another Sort ; and if this
 “ Method of Purging was not constant, accord-
 “ ing to the Idea he had had thereof, he would cor-
 “ rect, with great Freedom, what he had published
 “ thereupon in his Works, printed in 1748.”

Thirdly, Mr. *Verati* assured me, “ That the ten
 “ Cures, related in his Work just mentioned, were
 “ exactly made in the manner they are described :”
 And they are related with a good deal of Prudence,
 and with a Simplicity which characterizes the Truth.
 The fifth of them was told and certified to me by
 the Person himself, one Day when I visited Father
Trombelli, Abbot of the House in which he lives.
 These Cures are not such as give me Difficulty to
 believe them : We see, at least, that they are made
 with Speed : We see that the Disorder, if I may be
 allowed the Expression, defends itself against the
 Remedy, and does not give place but by little and
 little ; and that Nature makes no sudden Transition
 from one State to the other absolutely different, by the
 means of an Electricity scarce sensible. These Cures,
 I say, give me no Trouble to believe them ; because
 it appears to me natural enough, and I have said it
 a great while ago *, that a Fluid, active as the electric
 Matter, and which passes into our Bodies with so
 much

* In a Discourse read to the *Royal Academy of Sciences* just after
Easter 1746.

much Ease, may produce therein, in time, Alterations either * salutary or pernicious.

I learned nothing in the other Cities of *Italy*, which did not strengthen my Doubts in relation to those electrical Phenomena, which I had a Desire to verify in the Course of my Travels. Pere *La Torre*, Professor of Philosophy at *Naples*; M. *De la Garde*, Director of the Coinage at *Florence*, one who has been much engaged in these Inquiries; M. *Guadagni*, Professor of experimental Philosophy at *Pisa*; the Marquis *Maffei*, at *Verona*; Dr. *Cornelio*, at *Placentia*; Pere *Garò*, at *Turin*; all these, I say, with very excellent and well-contrived Machines, and with a great Desire of succeeding, have attempted many times to transmit the Odours, as well as the Powers of Drugs closed (carefully) in Tubes or Spheres of Glass, by electrizing them: All these have attempted to purge a Number of Persons; and, according to the Accounts they gave me, have never gained their Point; or the little Success they had, appeared too equivocal to draw therefrom Consequences conformable to those M. *Pivati* had believed to have seen in his Experiments.

I am now then, as it were, certain of what I began to believe last Year, when I printed my Treatise, intituled, *Recherches sur les Causes particulieres des Phenomenes Electriques*: I am, I say, as it were certain, that M. *Pivati* has been deceived by some Circumstance to which he had not given sufficient Attention; and what makes me believe it more than ever is, that he assured me himself, that this Transfusion of Odours, and of Drugs, through

D d d 2

electrized

* See these *Transf.* No. 476. p. 479. C. M.

electrized Glass Vessels, had never manifested itself to him but once or twice directly; I mean by a sensible Diminution of Bulk, and by such Emanations as the Smell was capable of perceiving.

Since I have understood *Italian*, I have been surprised not only to find this Confession in a Letter printed at *Lucca* *, but also to see, that it had not had all the Effect it ought to have had upon the Minds of those, who have been in a Situation to be instructed: For my own Part, had I known it earlier, I might have saved myself a great Part of the Trouble I have taken in verifying the Fact; and I am astonished, that they should be desirous of building upon such very slender Foundations.

It is however upon this pretended Transmission, and with a glass Tube, *which was cracked from one End to the other*, as M. *Pivati* tells you himself †; it is, I say, upon this Fact, than which, in my Opinion, nothing can be less certain, that they have established the Use and Effects of *lined Tubes*, of which they are willing to abate nothing. But how can we reconcile these two things, the almost never failing Operation of *lined Tubes*, upon so many Distempers which are said to have been cured, or considerably relieved, on one Part, and on the other the Transmission so very seldom to be perceived of the Odours of the Drugs inclosed in those Glasses, with

* Page 28. *Un tale deleguamento succedutomi in un cylindro, non mi è poi veramente succeduto in altri, di quali mi sòn servito per varie guarigioni.*

† *Si consumo la materia interna a segno, che si ridusse non ostante l'essere quasi ermeticamente serato alla sottiliezza di un delicato foglio di carta, e come un capo morto, che ne tenca più odore ni sapore, e fino il vetro medesimo quasi consunto si aprì da se stesso in più fisure per lungo.*

with which you electrize? If it is truly the *Peruvian* Balsam, the Benjamin, Camphire, &c. which, being animated by the electric Matter, have brought about so many Cures, as M. *Pivati* has given us in his Writings, why do not these strongly-scented Substances send forth their Effluvia copiously, and always, in those Places where the Experiments are made? And why do they not communicate themselves by their Odour to all Persons, who are penetrated thereby by means of Electrification? Will they say, that the Electricity, specifically operating upon their medical Virtue, separates it from their odoriferous Quality? Miserable Subterfuge! Which does not merit to be opposed seriously; and the more so, as it is by the Transfusion of their Odours, that they pretend to be assured of the Efficacy of their *lined Tubes*.

I am disposed to believe, that the Electricity may have cured or relieved distempered Persons; but I do not find the Proofs of M. *Pivati* sufficiently strong, or sufficiently certain, to make me conceive, that the *lined Glasses* have contributed to these good Effects. I think, and M. *Verati* himself appeared to me pretty much of the same Opinion, that if any one has been so happy as to cure Distempers by electrifying with Glasses containing Drugs, all that can be said in Favour of these Substances is, that they have not hindered the Operation of Electricity.

M. *Pivati* appears by his Conversation an honest and disinterested Person, and one capable of inducing me to be of his Opinion: But among the Facts which he collects in his Writings to support his Proofs, I find some that do not do much Honour to his

his Delicacy in choosing; and which may make him suspected of too great Credulity. Would one believe with him for Example, that the electric Virtue was capable of setting a Watch a going, which was stopped; and, by its means, of regulating its Motion, when so disordered as to be impracticable to be done by the Hands of the Workmen*? Would one believe with him upon the Faith of a Letter void of Authority, and without having tried it, “ that an
 “ Ounce of Mercury had been entirely evaporated
 “ through the Pores of a Glass Vessel, with which a
 “ Man was electrized, which had made his Skin of
 “ a leaden Colour, and which had been followed
 “ by a copious † Salivation?” This Fact, which was said to have been done at *Naples*, interesting as it is, had there made so little Noise, that I was not able to find any Traces of it during my Stay in that City, after the printing and publishing of the Book, in which it is cited.

If any one should think fit to say, that it is from Humour, or from some personal Interest, that I am so obstinate in disbelieving the Facts published in *Italy*, which are the Subject of this Memoir, I flatter myself, that so unjust an Imputation will make no Impression upon reasonable People, by whom I have the Honour of being known, either personally, or by my Writings. Have not I received and published in *France* all the Wonders in Electricity,
 which

* *Reflessioni fisiche sopra la medicina elettrica*, p. 103. *La subita efficacia (della elettricità) in dar giusto movimento alle mostre, di orologio, o ferme, o restie, o ritardansi senza rimedio.*

† *Ibid.* p. 153.

which have manifested themselves in *England*, in *Germany*, and in *Holland*, as soon as I have been able to be assured thereof by a Repetition of them? Have not I spoke and written concerning the Cure of the Paralytic of *Geneva*, as a Man truly persuaded of the Truth of the Fact, since it had been so justly authenticated *? By what Caprice then am I made more difficult of believing what passed in *Italy* than in other Countries, if the Phænomena, which are pretended to have been seen there, could have been repeated; or if the Testimonies, which they offered me, were not considerably weakened, or entirely abolished, when, being in the Places themselves, I was in a Condition of knowing their just Value?

Had I only consulted my personal Interest, to whom would it have been more convenient than to me, to have adopted these Novelties? If they were real, they would have been so many evident Proofs of a Principle †, by which I have endeavoured to account for the electrical Phænomena: A Principle, which as yet has sufficiently well served me, and which, having offered itself to Mr. *Watson* as well to myself, has enabled him likewise to give some Inferences exceedingly probable concerning them: Would not Odours, would not medical Substances, carried through the Pores of Glass, prove, without Doubt, that the *effluent* electric Matter served them for a Vehicle? If purging Substances were forced to

pass

* See my *Essay sur l'électricité des corps par la Paroie*, t. 1, p. 16, and my *Recherches sur les Causes particulières des phénomènes électriques*, 1749.

† *Essai sur l'Électricité des Corps*, p. 140 et suiv.

pass into the Hand, and into the Body, of an electrized Person, could one doubt of their being introduced there by the *effluent* Matter, which came to the electrized Body? If the Electricity restores Health to a sick Person, in delivering him from some vitious Humour, might not I say with great Probability, that this Effect is brought about by the Effluence of the electric Matter? Especially as I have demonstrated by Experiments, made with great Care, that this same Matter, in going from the Body electrized, accelerates, and considerably augments, the insensible Transpiration of Animals, and, in general, all organized Bodies, replete with Fluids.

I have then set apart my own Interest to follow the Truth; and if Prejudice has tended to lead me astray, it would be in inclining me to receive rather than call in doubt the Facts, which are the Subject of this Paper. It is only because I cannot consider them as true, that I refuse to believe them; and this even with Regret, as they favour my System: This indeed is of no great Importance; but what makes me more desire their Reality, is, the great Good which would result to Society. Could any good Subject, possessed of the Art of healing by Electricity, as M. *Privati* pretends to be, spend his whole Time better than in devoting it to the Relief of a great Number of human Creatures, afflicted with great Variety of Maladies? I am induced to believe, that the Greatness of this Idea has imposed upon those, who have published, without Doubt, with a little too much Precipitation, this new Medicine: The great Desire of being useful has made them hope; and the Goodness of their Hearts making them dis-

pense

pense too easily with the Severity of a necessary Examination, it may be imagined, that they have considered as real Success, what was in Truth only a Phantom.

It remains to say, that in these Researches I have coveted Truth, only for her own sake; and have no Interest in convincing those who may think proper still obstinately to believe, what has been published concerning lined Tubes, electrical Purgations, instantaneous Cures, &c. I do not pretend to make any of my Opinion, but those, who, having read without Prejudice what I have here related, may find themselves touched by my Reasons: But if after this there can be any one, upon whom the Love of the Marvellous can make a victorious Impression, I shall not think ill of them, if they embrace Opinions opposite to mine; *Qui vult decipi, decipiat.*

XXI. *An extraordinary Case of a Fracture of the Arm; communicated by Mr. John Freke, F. R. S. Surgeon to St. Bartholomew's Hospital.*

Read April 5. 1750. **T**HE following Extract of a Letter from Mr. *John Barde*, Surgeon, in *New York*, having been communicated to me, I thought the Case so curious, and to have been treated in so skilful and regular a manner, as to be worthy of being laid before this learned Society.

J. FREKE.

“ I N *May* 1746. as Colonel *Morris's* Lady was
 “ going from this City to *Morrisena*, the Co-
 “ lonel's Country Seat, she had the Misfortune of
 “ being thrown out of her Chaise by the Horses
 “ suddenly falling down; by which means she had
 “ both the Bones of her left Arm broke. She was
 “ immediatly conveyed to the *Hermitage*, a Coun-
 “ try Seat belonging to the Honourable *Joseph Mur-*
 “ *ray*, Esq; which is about a Mile and a Half from
 “ the Place where she met with this unlucky Acci-
 “ dent. Being sent for by the Colonel, I examined
 “ the Case, and found the Bones broke in an ob-
 “ lique Direction, a very great Contusion of the
 “ Muscles, and the Arm already tumified; which,
 “ together with the being three Months gone with
 “ Child, obliged me, previous to the Reduction,
 “ to bleed her in the Right Arm. I then care-
 “ fully reduced the broken Arm, and applied the
 “ proper Bandages.

“ The Case succeeded, with less Inflammation than
 “ usually attends more simple Accidents of this Kind;
 “ and, in about twelve Days, she ventured to go
 “ from the *Hermitage* to *Morrisena*, being about
 “ six Miles. But what I think remarkable in this
 “ Case is, that tho' the Ends of the fractured Bones
 “ had been exactly applied to each other, and tho'
 “ the Bandages had been continued forty Days, yet,
 “ upon their being removed, the Callus remained
 “ so soft and flexible, that her Arm could be bent
 “ with the greatest Ease into any Position, and appear-
 “ ed perfectly strait, to the Satisfaction of the Patient
 “ and Family. But, as I observed the Callus to be
 “ uncon-

“ unconfirmed, I re-applied the Bandage, which remained on five Weeks longer.

“ Upon a second Examination, I found, to my Surprise, and the great Uncasiness of the Patient and Family, the Callus as soft and yielding as before. I therefore could not help thinking this Case to be similar to two Cases which *Hildanus* gives the History of from his own Practice: For, as the Patient at this time was about five Months gone with Child, Nature determined those nutritious and agglutinating Juices, which were necessary to form and consolidate the Callus, into a different Chanel; *viz.* to the Support and Increase of the *Fœtus*. As a Consequence of this Opinion, I contrived a Bandage made of Velvet, with four thin Blades of Steel, a Quarter of an Inch broad, and seven Inches long, which were covered with Velvet, and fixed to the Inside of the Velvet Bandage; and to the Bandage itself I fixed four small Buckles, with their corresponding Straps. The Bandage thus contrived, and buckled on the Arm, resembled a Musfitie, and was wore with the greatest Conveniency, keeping the Arm in a strait Direction, for four Months longer. In the mean time, the Patient was made easy by the encouraging Hopes I gave her, that, after her Labour, the Oeconomy of Nature would be more immediately directed to the Recovery of the Use of her Arm. And, indeed, so it turned out: For the Callus remained unconfirmed, her Arm useless, and at particular times painful, till within nine Days of her Delivery; when, all on a sudden, she acquainted the Colonel, that her Arm was quite

“ free from Pain, and had a very different Feeling
 “ from what it had before. From that time, in less
 “ than a Month, the Callus was intirely confirmed,
 “ and the Patient recovered the Use of her Arm;
 “ which, considering the oblique Direction of the
 “ Fracture, and the long-continued Softness of the
 “ Callus, has its natural Beauty and Straitness
 “ wonderfully preserved.

“ I know that a Woman’s Pregnancy is mentioned
 “ in general, by several Authors, as an Hindrance of
 “ the Callus being so soon confirmed as in other
 “ Circumstances. But, except the two Cases men-
 “ tioned by *Turner*, and taken from *Hildanus*, I
 “ do not remember to have read any History, where
 “ the usual Oeconomy of Nature, in restoring a
 “ fractured Bone, was so intirely, and for so long a
 “ Time, interrupted; and where the Cause of such
 “ an Interruption appears so plain, as in the Case I
 “ have been here relating,” &c.

XXII. *A further Account of the Libellæ or*
May-flies, from Mr. John Bartram of
Pensylvania, communicated by Mr. Peter
Collinson, F. R. S.

Read April 5. 1750. SOME time ago I laid * before the
 Royal Society my Observations on
 the wonderful Appearance of the *Libellæ* or May
 flies of *England*. This Account being perused by my
 ingenious

* See this Transf. p 323.

ingenious Friend Mr. *Bartram*, excited him to make the following Remarks on their Appearance in *Pennsylvania*. By the Specimens before you, the May-flies of *America* have no very remarkable Difference from ours; excepting a few Days in the Fly State, they live all the Year a Water Insect. Their Bodies being replenished with an oily Matter, they easily quit their Husks, and rise up to the Surface of the Water, and disperse themselves a Mile or more back in the Woods, whilst others stay near the Water.

May the 4th 1749. I perceived many had attained Wings, and were very thick spread on the Bushes and Grass, by the River-sides. The second Day after their leaving their aquatic Abode they cast another Skin, after which their Tails are longer, and their Wings drier, and more transparent. The 5th and 6th was rainy, the 7th windy; so very few came out. The 8th were cool; so few were seen: But the 9th and 10th, being warm, many swarmed late in the Evening; and the 11th, 12th, 13th, they swarmed abundantly. What I call swarming, was their gathering thick as Bees, near the Rivers, to lay their Eggs in the Water.

In their Flight they mount to the Tops of Trees, 20 or 30 Feet high: Their Motion is surprising, hovering up and down, rising and falling, 7 or 8 Feet at a time: This I take to be the Time and Manner of their Impregnation. After which they fly to the Brooks, cast out their Eggs, and perish immediately: Their Eggs sink directly to the Bottom, and lodge amongst the Mud and Gravel, and may be Food for some minute Water Animal. From their Eggs proceeds a deformed Grub, which subsists under
Water,

Water; and is Food for Eels, until next Season, that it attains its Fly State, and then is Food for Fish and Fowl.

The Reason of their being so long in coming forth this Year was, the cold chilly Weather: Other Years, in a warm Season, in five Days they would have performed all their Functions, and disappeared.

We have two other smaller Kinds, that very much resemble the former, but they come later by two or three Weeks: What is most remarkable, the Males are black, and live several Days after the Females.

ERRATA.

No. 491. p. 8. in the Title of Art. IV. for *D. Suarez, M. D.* read *Jacobum de Castro Sarmiento, M. D.* Item, the same in the Contents.

No. 493. p. 193. l. 2. in the Title of Art. I. and in the Contents the same, for *July 15.* read *July 18*

Ibid. p. 213. *May 13.* for 33, 23. (the Height of the Barometer.) read 30, 23. and *July 24.* for 22, 66. read 29, 66.

No. 494. p. 342. l. 1. for *magis vasculum tenera,* read *vasculum, magis tenera,*

PHILOSOPHICAL TRANSACTIONS.

For the Months of *April, May, June, and July,*
1750.

- I. *A Catalogue of the fifty Plants from Chelsea Garden, presented to the Royal Society, by the worshipful Company of Apothecaries for the Year 1749.* p. 403
- II. *A Letter from Daniel Peter Layard, M. D. and F. R. S. to Dr. Mead, containing an Account of the Case of a young Lady who had an extraordinary Impostume formed in her Stomach.* p. 406
- III. *An Account of an irregular Tide in the River of Forth, by Mr. E. Wright.* p. 412
- IV. *The Case of a Tumor growing on the Inside of the Bladder, successfully extirpated by Mr. Joseph Warner, Surgeon to Guy's Hospital.* p. 414
- V. *Remarks upon the Solar and the Lunar Years, the Cycle of 19 Years, commonly called the Golden Number, the Epact, and a Method of finding the Time of Easter, as*
it

The CONTENTS.

it is now observed in most Parts of Europe.
By the Right. Hon. George Earl of Mac-
clesfield F.R.S. p. 417

VI. *An Account of the Morbus Strangulato-*
rius, communicated in a Letter from John
Starr, M. D. to C. Mortimer, M. D.
Secret. R. S. &c. p. 435

VII. *An Examination of the Strength of sever-*
al of the principal purging Waters, espe-
cially of that of Jessop's Well; by the Rev.
Stephen Hales D. D. & F. R. S. commu-
nicated in a Letter to Cromwell Mortimer
M. D. Secr. R. S. with a Letter from
Swithin Adey M. D. F. R. S. to Dr. Hales,
on the Virtues of the said Well. p. 446

VIII. *An abstract of a Discourse intitled,*
Reflexions on the Medals of Pescennius
Niger, and upon some Circumstances in
the history of his Life; writen in French
by Mr. Claude Gros de Boze, keeper of the
Medals in the French King's Cabinet, &c.
and sent by him to Dr. Mead, who com-
municated it to this Society. By John Ward,
Rhet. Prof. Gresh. & F. R. S. p. 452

IX. *A Letter from Robert More Esq; to the*
President, containing several curious Re-
marks in his Travels through Italy. p. 464

The CONTENTS.

- X. *Extract of Letter from Mr. William Arderon F. R. S. to Mr. Henry Baker F. R. S. containing an Account of a Dwarf; together with a Comparison of his Dimensions with those of a Child under four Years old; by Mr. David Erskine Baker.* p. 467
- XI. *Part of a Letter from Robert More Esq; to Mr. W. Watson F. R. S. concerning the Method of gathering Manna near Naples.*
p. 470
- XII. *A Letter from John Huxham M. D. F. R. S. to C. Mortimer M. D. Secr. R. S. containing Observations on the Northern Lights, seen Feb. 15 and 16, 1749-50.*
p. 472
- XIII. *A Letter from John Starr M. D. to John Huxham M. D. F. R. S. containing an Account of an Horse bit by a mad Dog.*
p. 474
- XIV. *Descriptio Fortus monstrosi sine ullo Sexûs Signo, cum Regali Societate communicata per Job Baster, Acad. Cæsar. et Reg. Soc. Lond. Soc.* p. 479
- XV. *Some Experiments on Substances resisting Putrefaction; by J. Pringle M. D.* p. 480
- XVI. *An attempt to explain an antient Greek Inscription, ingraven upon a curious bronze cup*

The CONTENTS.

cup with two handles, and published with a draught of the cup by Dr. Pococke, in his Description of the East, Vol. II. Part 2. pag. 207. By John Ward, Prof. Rhet. Gresh. and F. R. S. . p. 488

XVII. *A Letter from Mr. Henry Baker F. R. S. to the President, containing Abstracts of several Observations of Auroræ Boreales lately seen.* p. 499

XVIII. *A Description of a Mariner's Compass, contrived by Gowin Knight M. B. F. R. S.* p. 505

XIX. *An Account of some Improvements of the Mariners Compass, in order to render the Card and Needle, proposed by Doctor Knight, of general Use, by John Sineaton, Philosophical Instrument-maker.* p. 513

XX. *The Description of a Fish, OPAH Guinienfium, shewed to the Royal Society by Mr. Ralph Bigland.* p. 518

XXI. *A Letter from John Burton M. D. to C. Mortimer M. D. & Sec. R. S. concerning the Extirpation of an Excrecence from the Womb.* p. 520

E R R A T A:

- N^o. 492, p. 90, l. 7, for 1793, read 1743; l. 8, for 1796, read 1746; l. 9, for 1798, read 1748. *ibid.* pag. 91, Comet anno 1729, for 91, read 41; 1729, for 9069 0, read 406980; 1739, for 15, read 25; 1744, for 27, read 17; *ibid.* p. 162, in the Title, l. 1. and in the Contents Art. XIV. dele *the Rev.* p. 164, l. 14, for *the 112th Year of Nab.* read *the 1112th Year of Nab. the 24th Day of Thoth.* p. 169, l. 19, for 313, read 3^h 1; l. 23, for 4^h 4', read 21^h 4'. p. 172, in the Table, for 56.6, read 56' 0".
- N^o. 495. Article II. in the Title, instead of, *to the President*, read *to Richard Mead M. D. &c.* *Ibid.* for 1749-30, read 1749-50.
- Pag. 411, line 12, for *Luctus* read *Licetus*. *Ibid.* Note 7, read *Licetus*.
- Page 517, line 24, for *contained* read *containing*; and for *fixing* read *fixed*.

- I. *A Catalogue of the fifty Plants from Chelsea Garden, presented to the Royal Society, by the worshipful Company of Apothecaries for the Year 1749, pursuant to the Direction of Sir Hans Sloane, Bart. Med. Reg. et Societat. Reg. nuper Præf. by John Wilmer, M. D. Clariff. Societat. Pharmacæut. Lond. Soc. Hort. Chelsean. Præfect. et Prælect. Botan.*

Read April 1351. **A** Conitum coerulæum seu napellus.
26. 1750. *S. C. B. P.* 183.

- 1352 Aconitum Pyrenaicum; ampliore folio tenuius laciniato. *T.* 424.
1353 Adhatoda minor Canariensis. *Pluk. Phyt.* Fig. 1.
1354 Apocynum majus Syriacum rectum. *Cornut.* 91.
1355 Aristolochia, Pislolochia Cretica. *C. B.* 107.
1356 Baccharis Africana; Coronopi folio. *Vaill. Acad.*
1357 Barba Jovis Africana; foliis viridibus pinnatis; flore coerulæo. *Boerh.*
1358 Blattaria alba. *C. B.* 241.
1359 Bupleurum foliis linearibus acutis scissilibus. *Fl. Leyd.*
1360 Centaurea calicibus setacco-spinosis, foliis lanceolatis petiolatis dentatis. *Hort. Cliff.*
1361 Commelina foliis ovato-lanceolatis; petalis tribus majoribus æqualibus. *Lin.*
1362 Convolvulus argenteus elegantissimus; foliis tenuiter incis. *Inst. R. H.*

- 1363 Convolvulus peregrinus pulcher ; folio Betonicae. *J. B.*
- 1364 Convolvulus Siculus minor ; flore parvo auriculato. *Boc. Rar.*
- 1365 Digitalis lutea major ; parvo flore. *Mor. Hist.*
- 1366 Dracocephalon Canariense triphyllon ; Cedronella. *H. Amstel.*
- 1367 Echium Creticum angustifolium rubrum. *C. B. P. 255.*
- 1368 Emerus Americanus ; siliquâ incurvâ. *Inst. R. H.*
- 1369 Gallium saxatile minimum supinum et pumilum. *Inst. R. H. 115.*
- 1370 Glaucium hirsutum ; flore phoeniceo. *Tourn.*
- 1371 Glaucium Orientale ; flore magno aureo. *T. Cor.*
- 1372 Helleborus Fumariae foliis. *Amman. Ruth. 74.*
- 1373 Hieracium calyce barbato. *Col. Ec. 2. 27.*
- 1374 Jasminum Africanum ; ilicis folio ; flore albo. *Com. Rar.*
- 1375 Linaria pumila ; foliis carnosiss ; flosculis minimis flavis. *C. B. 213.*
- 1376 Melilotus Italica ; folliculis rotundis. *C. B. P. 331.*
- 1377 Melissa Romana molliter hirsuta et graveolens. *H. R. Par.*
- 1378 Molleria annua erecta ; foliis conjugatis ; floribus luteis spicatis. *Houft.*
- 1379 Monarda floribus capitatis ; caule obtuso. *Hort. Cliff.*
- 1380 Myagrûm siliculis sulcatis rugosis ; foliis obtusis dentatis. *Hort. Upsal.*
- 1381 Nardus Americana procerior ; foliis caesis. *Pluk. Alm.*

- 1382 Obeliscotheca, Hydrophylli foliis, lobis latioribus. *Vaill.*
 1383 Obeliscotheca, Hydrophylli foliis, lobis angustioribus. *ibid.*
 1384 Oxys lutea. *J. B.* 388.
 1385 Paitheniastrum Helenii folio. *Hort. Elt.*
 1386 Scrophularia, Ruta canina dicta, vulgaris. *C. B.* 236.
 1387 Scrophularia foliis, Filicis modo, laciniatis, vel Ruta canina latifolia.
 1388 Sideritis orientalis; Phlomidis folio. *T. Cor.*
 1389 Sinapisstrum Lusitanicum, triphyllum, flore rubro siliquis corniculatis.
 1390 Stachys alba. *Michel.*
 1391 Staphylo-dendron Virginianum triphyllum. *T.* 616.
 1392 Statice Lusitanica; Scorzoncræ folio. *Inst. R. H.* 341.
 1393 Tribulus terrestris; foliis Ciceris; fructu aculeato. *C. B. P.*
 1394 Thlaspi Virginianum Iberidis foliis amplioribus et ferratis. *Tourn.*
 1395 Veronica cœrulca; trifido et quinquefido folio. *Fl. Bat.*
 1396 Veronica petræa sempervirens. *Pon. Bald.*
 1397 Veronica Virginiana altissima; spica multiplici; floribus candidis.
 1398 Urtica foliis profunde laciniatis; semine lini. *Amman.*
 1399 Xylon Americanum præstantissimum; semine virescente. *Lin.*
 1400 Zacintha, sive Cichorium verrucarium. *Matth.* 505.

II. *A Letter from Daniel Peter Layard, M. D. and F. R. S. to the President, containing an Account of the Case of a young Lady who had an extraordinary Impostume formed in her Stomach.*

S I R,

Read May 3. 1750. **T**HE Communication of the following Case, which I have the Honour of laying before you, will not, I hope, be deemed an assuming Step in me: My only Design is, in Obedience to your Commands, to give you as exact an Account as I am able of this unexpected Cure; and I shall esteem it the highest Pleasure, should any Benefit accrue from this Observation. Give me leave to subscribe myself, with all possible Respect,

S I R,

Your most humble

*Dean-street, Feb. 17.
1749 30.*

and most obedient Servant,

D. P. LAYARD.

MISS——a young Lady of seventeen Years of Age, being at a Boarding-School about three Miles from this City, was, on the 28th of *November 1745.* taken with profuse Sweats, which, after some Continuance, and weakening her much, were stopped by means of *saline Draughts*, made with *Elixir Vitrioli.*

On

On the Removal of those Sweats an Obstruction of the *Menses*, with all its Symptoms, ensued. A Shortness of Breath, a dry Cough, an acute Pain in the Left *Hypochondrium*, *Rigors*, &c. were taken for the Signs of a *Peripneumonia*; and, the Medicines usually prescribed having no Effect, a Blister was applied on the left *Hypochondrium*. The *Fætid*s, and *Musk*, as in a *nervous* Case, were also administered in large Quantities, but with as little Success.

It being thought advisable to bring the young Lady to Town, I first saw her on the 12th of *Feb.* 1745-6. when I observed a large prominent *Tumor* on the left *Hypochondrium*, which reached to Part of the Right, filling up the *Epigastrium* and *Scrobiculum Cordis*, where she complained of a constant acute Pain. The *Muscles* of the *Larynx*, *Pharynx*, and Neck, were much swelled, and the *Glands* indurated. The other Symptoms were a continual quick Pulse, Thirst, hoarse Cough, Difficulty of breathing, *Cardialgia*, and Obstruction in the *Oesophagus*, so that, as soon as any Liquid "fell down," as she expressed it, "to the Pit of her Stomach," she instantly threw it up with violent Pain, *Borborigmi*, *Eruæations*, and *Singultus*.

On the 14th, finding the Symptoms increase, especially the Obstruction in the *Oesophagus*, and apprehending that an *Abscess* was forming in the *Stomach*, I desired Dr. Mead should be called in, who confirmed me in my Opinion. In order to allvage the Inflammation, a cooling *mucilaginous Mixture*, and a *Sperma Ceti* one, were prescribed, as also a *laxative Glyster*. Next Day, being told, that not a Drop of the Mixtures could be admitted
into

into the *Stomach*, Dr. Mead took his Leave, advising the Repetition of the Glyster every three or four Days, as Necessity might require, and that Nature should be watched, in case of a favourable Turn, which He did not much expect, having observed, that those *Abscesses* more frequently terminate in a *Gangrene* than by *Suppuration*.

On the 16th the Glyster brought away with the *Fæces* some Pieces of Membranes, about a Finger's Length, and two in Breadth; to lubricate the *Intestines* I directed ten Ounces of plain Mutton Broth to be injected, which, after the first time, was constantly absorbed and was repeated twice every Day, till the 3d of *May*.

In this State, with no other Sustainance than these *Broth-Glysters*, the *laxative* one repeated every third Day, and a warm *carminative Plaster* applied on the *Tumor*, did the Patient continue till the 17th of *March*, when, observing an Intermission in the Pulse, and hoping that a Decoction of the *Cort. Peruv.* might corroborate the Solids, if absorbed, as the *Broth-Glysters* were, I directed eight Ounces of the Decoction to be injected, and repeated four Hours after: By Accident, the first was not half thrown up; the second, on the 18th of *March*, at Two o'Clock in the Morning, had a very extraordinary Effect; for being entirely absorbed, about two Hours after, the young Lady complained of a most acute Pain in her *Stomach*, which by its Violence brought on a profuse Sweat, and threw her into a *Styckpe*, wherein she remained a full Quarter of an Hour; then, shrieking, made Signs to her Nurse to bring her the *Bason*; she vomited near two Pounds

of *grumous Blood*, and then some purulent Matter ; thereupon she discharged by Stool above four Quarts of well digested *Pus*, with several Pieces of *Membranes*, like those before-mentioned. The purulent Discharge continued gradually decreasing till the 23^d of *April*. *Balsamics*, and small Quantities of thin Veal and Mutton-broths, were daily given. *April* the 29th the Patient was purged with Pulp of *Cassia*. On *May* the 3d the *Mutton-broth Glysters* were omitted, the *Stomach* now performing its Office. The 7th ten Ounces of Blood were taken from the Foot, which brought down the *Menses*. The *Tumefaction* and *Induration* of the *Muscles* and *Glands* of the Neck were removed by the continual Application of the *Emplastr. Saponac.* And after the Use of *Stomachics*, and *mineral Waters*, the young Lady was perfectly cured on the 17th of *June* 1746. and has continued well ever since.

It may not be improper to observe, that the *Stomach*, on account of the Number of Blood-vessels it is furnished with, is as liable (1) to *Inflammations*, and *Abscesses*, as any Part of the human Body. These are occasioned by a Stagnation of the Blood, which, if not speedily removed, must greatly endanger the Patient's Life, by obstructing the necessary vital Functions of that *Viscus*. The speedy Progress of this Disease, and the Remoteness of the Part from proper Applications, render its Termination mostly fatal ; and, as *Dr. Mead* judiciously observed, these *Abscesses* more frequently terminate by a *Gangrene*,
than

(1) *Boerhaave* in Aphorism. de ventricul. inflam., p. 228. Articul. 951. 952. 955.

than come to *Suppuration*. Those that do suppurate, generally form *Ulcers*, penetrating into the Cavity of the *Abdomen*, and sometimes also perforate the *Integuments*, as the following recorded Observations testify. (1) " Monsieur PETIT has found a " *carcinomatous* and *fistulous Ulcer*, which eat " through the *Fundus Ventriculi*, and the *Integuments* of the *umbilical Region*.

(2) " Monsieur DUVERNEY also found a Hole in a " *Stomach*, which he could pass his Thumb through : " This Hole was near the *Pylorus*, which was extraordinarily dilated.

(3) " Monsieur LITTE observed an Ulcer of five " Lines Diameter, about one Inch and a half from, " the *Pylorus*; and found three Pints of *grumous* " and *serous* Blood in the *Stomach* of a young Man, " who had voided large Quantities of Blood..

(4) " The same Gentleman gives an Account of a " *Tumor* on the right Side, which being opened " between the *last* of the *true Ribs*, and the *first* of " the *false ones*, there issued out *Pus*, *Stones*, and " the *Succus Gastricus*, with Pieces of digested Food.

(5) " And Mr. ATKINSON tells us in the *Philosophical Transactions*, that he opened a *Tumor* on " the upper Part of the Belly, out of which Opening part of the *Omentum* came, and whatever the " Patient eat or drank for eight or ten Days: Yet " the

(1) *Mém. de l'Academ. des Sciences*, Ann. 1716. p. 312.

(2) *Hist. de l'Academ. des Sciences*, Ann. 1704. p. 27.

(3) *Ibid.* p. 29.

(4) *Ibid.* p. 28.

(5) *Philos. Trans.* No. 371.

“ the Patient, contrary to his Expectations, was
 “ cured in six Weeks.”

But the following Observation from FORESTUS comes the nearest to our Case “ *Puella quæ decim annorum, per biennium ferè cum de dolore ventriculi conquereretur, anno tertio tumorem manifestè viderunt parentes, in eo loco; neque tunc quicquam consilii aut remedii tentatum. Hincruptionem animadverterunt, excrevitque puella materiam, biliosam, pituitosam, ac saniosam, per alvum: ex his apostema apparuit,*” &c. (6).

“ LUTUS (7) relates several Instances of Persons
 “ who have lived a long while without Food; but
 “ when they could admit of Liquids; and the young
 “ Lady which Monsieur LITRE (8) nourished with
 “ *Broth-glysters*, in which a Yolk or two of Eggs,
 “ and sometimes a Glass of Wine, were mixt, could
 “ also keep Water in her *Stomach*, tho’ no other
 “ Fluid.” An Advantage which our Patient was
 deprived of.

From what I have related it appears, that our young Lady had an *Abscess* in her Stomach, which gradually ripened, and then broke, suppurated, digested, and cicatrized, as all other *Abscesses* do; and that during this time, which was near three Months, she was almost all the while nourished solely by the *Mutton-Broth Glysters*.

III. Ac.

(6) *Forestus* Observ. 22. de ventricul. ulcer.

(7) *Lucius* de his qui diu vivunt sine alimento.

(8) *Mém. de l’Acadèm. des Sciences.* Ann. 1716. p. 183.

III. *Account of an irregular Tide in the River of Forth, by Mr. Edward Wright.*

Read May 3.
1750.

AS the following Account of a very uncommon anomalous Tide in the River of *Forth*, contains several Circumstances worthy Observation, I thought it might not be disagreeable to that learned and famous Society to which I address it.

There are in this River, at Ebbing and Flowing, certain irregular Motions, not to be found in any other River in *Scotland*, perhaps in *Great Britain*, or even in all *Europe*, called by the common People betwixt the Villages of *Alloa* and *Culross*, Leakies, which Name I shall likewise make use of, for want of a better. This Leaky is this: When the River is flowing, before high Water, it intermits and ebbs for a considerable time, after which it resumes its former Course, and flows till high Water; and, *vice versa*, in the Ebbing, before low Water, the River flows again for some time, and then ebbs till low Water. The Leaky begins at a Place called *Queen's Ferry*, seven Miles above *Leith*, at neap Tide, and low Water, and goes to the House of *Maner*, which is about twenty-five Miles above *Queen's Ferry*, which is to be understood by Water; for in this River, from a little above *Alloa* to *Stirling*, there are such a prodigious Number of Turnings and Windings, that though it be but four Miles betwixt these two Places by Land, yet it is twenty-four by Water. This I take notice of rather, as I take these Windings to be the Cause of the Leakies. At Neap Tide and high

high Water, as also at Spring Tide and low Water, the Leaky reaches as far as the Sea fells, which is to the Groves of *Craigforth*, nineteen Miles above *Maner House*, and three above the Town of *Stirling*. At *Queen's Ferry* there are no Leakies at Neaps and Springs at high Water, nor in the latter at low Water; they begin betwixt *Borrowstowness*, a Village about seven Miles above *Queen's Ferry*, and the Mouth of a Rivulet called *Carron*, five or six Miles further up the River than *Borrowstowness*. What is very remarkable, in the very lowest Neaps the Leaky, after it has ebbd for some time, before high Water, makes up again, and will be two Feet higher than the Main Tide. In the Beginning of the Spring Tides, it does not rise so high by a Foot: At the dying of the Stream, it is often two Feet higher than the Main Tide, which is to be understood, before high Water, when the Leaky makes up again. At Neap Tide and low Water it will ebb two Hours, and fill as much, and at full Water ebb an Hour, and fill another.

It is likewise to be remarked, that at Change of the Moon, at low Water, the Leaky will continue two Hours, the Beginning of the Tide for that Time, which then stands, and does not ebb till Flood (the Beginning of the Flowing), and at full Water, will ebb and flow an Hour or more.

It is observable, that at full Moon, there are no Leakies, either at high or low Water, in the Spring Tides which are at that time, but in the Neaps which follow them, these Motions are observable, as before described; as also in the Spring Tides, which happen upon the Change of the Moon, called by the Commonalty, the Overloup, there are

Leakies both at high and low Water. All this is to be understood, when the Weather is seasonable; for, otherwise, these Motions are not so discernible.

This Account I have collected partly from my own Observation, having past a great Part of my Life at a Country seat near *Aloa*, where the Leakies are to be seen in great Perfection, and partly from what I have learned from People living on different Parts of the River, whose Observations, as well as my own, I find exactly agree with those of a learned * Relation of mine, who, near seventy Years ago, diligently observed and enquired into the Phænomena of this irregular Tide.

IV. *The Case of a Tumor growing on the Inside of the Bladder, successfully extirpated by Joseph Warner, Surgeon to Guy's Hospital; communicated in a Letter to the President.*

Read May 10.
1750.

AN Excrescence or Tumor arising from the internal Coat of the Bladder is a Disease, though not very common, yet sufficiently known to the Curious: But I believe that hitherto, no one has attempted the Cure of this Disorder by Extirpation, nor indeed can it be supposed, that the Instances are frequent, where the Operation is practicable. But as it is notorious from the History of Physick, and Surgery, that several Disorders which
were

* His Observations were communicated to Sir Robert Sibbald, in order to assist him in compiling a *Scotish Atlas*.

were formerly unobserved, have been found to occur frequently, after their Nature has been once discovered, and exactly described, I flatter myself the Publication of this Account may possibly throw some Light on the present Subject.

Mary Bevan, aged 23, on the 24th of *June* 1747, strained herself by endeavouring to lift a great Weight; she was immediately seized with violent Pain in the Small of her Back, and a total Suppression of Urine; which Symptoms, notwithstanding the several Methods used for her Relief, continued til the 29th of the same Month; when an eminent Physician and Man-midwife was called to her Assistance; who drew off her Urine with the Catheter. During the Suppression, she was seized with an acute Fever, and for 18 or 20 Hours before her Urine was drawn off, she discharged by the Mouth a great Quantity of saltish Water tinged with Blood; which, upon lying down, flowed in so great Quantities as to threaten Suffocation.

In *April* 1750, she applied to me: Upon Enquiry I learnt she had never been able, from the Moment of the Accident, to void a Drop of Urine without the Assistance of the Catheter, which had been made use of ever since two or three times every twenty-four Hours; that she was in continual Pain, and had been lately much weakened by having several times lost considerable Quantities of Blood, occasioned by the Force made use of for the Introduction of that Instrument. Upon examining her with my Fore-finger, which I introduced with great Difficulty through the *Meatus Urinarius*, I discovered a considerable Tumor, which seemed to be of a fleshy Substance, and took its Rise from the lower Part of
the

the Bladder near its Neck ; the Extent of which I could with Difficulty reach. She informed me, she first discovered this Swelling about twenty Months before. I observed it to protrude a little way out of the *Meatus Urinarius* upon straining to make Water when the Bladder was full ; but, upon ceasing to strain, it presently returned.

It had preserved pretty nearly the same Appearance ever since it was first taken notice of ; and about eighteen Months ago, a small Incision was made into it, on Presumption of its containing a Fluid, but without any Effect.

The Method I took for the Extirpation of the Tumor was this: Having first prepared her as before the Operation for the Stone ; when her Bladder was full, I made her strain as though she was going to make Water, upon which I perceived the Tumor to protrude a little ; this I effectually secured from returning into the Bladder by the Help of a crooked Needle and Ligature passed through the Tumor in different Directions, and endeavoured to draw it out through the *Meatus Urinarius*, but could not effect it by reason of its Largeness ; seeing this, I dilated the *Meatus Urinarius* on the right Side by cutting it upwards about half way towards the Neck, when by pulling the Tumor forwards, I had sufficient room for tying a Ligature round its Basis, which was very broad.

For the three first Days after the Operation, she complained of a good deal of Pain in the *Audomen*.

On the sixth Day, the Tumor dropt off.

From the first of the Operation, she voided her Urine without any Assistance, and is now perfectly well in every respect.

V. *Remarks upon the Solar and the Lunar Years, the Cycle of 19 Years, commonly called the Golden Number, the Epact, and a Method of finding the Time of Easter, as it is now observed in most Parts of Europe. Being Part of a Letter from the Right Honourable George Earl of Macclesfield to Martin Folkes, Esq; President of the Royal Society.*

Of the Solar Year.

Read May 10. 1750. **T**HE mean *Tropical Solar Year*, or that mean Space of Time wherein the Sun, or Earth, after departing from any Point of the Ecliptic, returns to the same again, consists, according to Dr. *Halley's* Tables, of $365^d, 5^h, 48', 55''$: Which is less by $11', 5''$, than the mean *Julian Year*, consisting of $365^d, 6^h, 0', 0''$.

Hence the Equinoxes and Solstices anticipate, or come earlier than the *Julian* Account supposes them to do by $11', 5''$, in each mean *Julian Year*; or $44', 20''$ in every four; or $3^d, 1^h, 53', 20''$, in every four hundred *Julian Years*.

In order to correct this Error in the *Julian Year*, the Authors of the *Gregorian* Method of regulating the Year, when they reformed the Calendar in the Beginning of *October 1582*, directed that three intercalary Days should be omitted or dropped in every four hundred Years; by reckoning all those Years,
whose

whose Date consists of a Number of entire Hundreds not divisible by 4, such as 1700, 1800, 1900, 2100, &c. to be only Common, and not Bissextile or Leap Years, as they would otherwise have been; and consequently omitting the intercalary Days, which, according to the *Julian Account*, should have been inserted in the Month of *February* in those Years. But at the same time they order'd that every fourth hundredth Year, consisting of a Number of entire Hundreds, divisible by 4, such as 1600, 2000, 2400, 2800, &c. should still be considered as Bissextile or Leap Years, and, of consequence, that one Day should be intercalated as usual in those Years.

This Correction, however, did not entirely remove the Error: For the Equinoxes and Solstices still anticipate $1^h, 53', 20''$ in every four hundred *Gregorian* Years.

But that Difference is so inconsiderable as not to amount to twenty-four Hours, or to one whole Day, in less than 5082 *Gregorian* Years.

Of the Lunar Year, Cycle of 19 Years, and the Epact.

The Space of Time betwixt one mean Conjunction of the Moon with the Sun and the next following, or a mean *Synodical Month*, is equal to $29^d, 12^h, 44', 3'', 2'''$, 56^{iv} , according to Mr. *Pound's* Tables of mean Conjunctions.

The Common Lunar Year consists of 12 such Months.

The

The Intercalary or *Embolimæan* Year consists of 13 such Months.

In each Cycle of 19 Lunar Years, there are 12 Common, and 7 Intercalary or *Embolimæan* Years, making together 235 Synodical Months.

It was thought, at the time of the General Council of *Nice*, which was holden in the Year of our Lord 325, that 19 *Julian* Solar Years were exactly equal to such a Cycle of 19 Lunar Years, or to 235 Synodical Months; and therefore, that, at the End of 19 Years, the New Moons or Conjunctions would happen exactly at the same Times, as they did 19 Years before: And upon this Supposition it was, that, some time afterwards, the several Numbers of that Cycle, commonly called the Golden Numbers, were prefixed to all those Days in the Calendar, on which the New Moons then happened in the respective Years corresponding to those Numbers; it being imagined, that whensoever any of those Numbers should for the future be the Golden Number of the Year, the New Moons would invariably happen on those Days in the several Months, to which that Number was prefixed.

But this was a Mistake :

	d h ' " ''
For 19 <i>Julian</i> Solar Years contain	6939, 18, 0, 0, 0
Whereas 235 Synodical Months	6939, 16, 31, 56, 30
contain only	}
And are therefore less than 19	}
<i>Julian</i> Solar Years by	} 0, 1, 28, 3, 30.

This Difference amounts to a whole Day very nearly in 310.7 Years, the New Moons anticipating,
H h h

or falling earlier, by 24 Hours in that Space of Time, than they did before : And therefore now in the Year 1750, the New Moons happen above four Days and a half sooner, than the Times pointed out by the Golden Numbers in the Calendar.

In order therefore to preserve a sort of regular Correspondence betwixt the Solar and the Lunar Years, and to make the Golden Numbers, prefixed to the Days of the Month, useful for determining the Times of the New Moons, it would be necessary when once those Golden Numbers should have been prefixed to the proper Days, to make them anticipate a Day at the End of every 310.7 Years, as the Moons will actually have done ; that is to set them back one Day, by prefixing each of them to the Day preceding that, against which they before stood.

But as such a Rule would neither be so easily comprehended or retained in Memory, as if the Alteration was to be made at the End or at the Beginning of complete Centuries of Years ; the Rule would be much more fit for Practice, and keep sufficiently near to the Truth, if those Numbers should be set back nine Days in the Space of 2800 Years ; by setting them back one Day, first at the End of 400 Years, and then at the End of every 300 Years for eight times successively : whereby they would be set back, in the whole, nine Days in 2800 Years. After which they must again be set one Day back at the End of 400 Years, and so on, as in the preceding 2800 Years. By which means the Golden Numbers would always point out the mean Times of the New Moons, within a Day of the Truth.

It is plain however that the Lunar Year will have lost one Day more than ordinary, with respect to the Solar Year, whenever the New Moons shall have anticipated a whole Day; as they will have done at those times, when it is necessary that the Golden Numbers should, by the Rule just now given, be set back one Day: and consequently the Epact, for that and the succeeding Years, must exceed by an Unit the several corresponding Epacts of the preceding 19 Years.

For the Epact is the Difference, in whole Days, betwixt the common *Julian* Solar and the Lunar Year; the former being reckoned to consist of 365, and the latter of only 354 Days. If therefore the Solar and the Lunar Year at any time should commence on the same Day, the Solar would, at the End of the Year, have exceeded the Lunar by 11 Days, which Number 11 would be the Epact of the next Year: 22 would be the Epact of the Year following, and 33 the Epact of the Year after that, the Epacts increasing yearly by 11. But as often as this yearly Addition makes the Epact exceed 30, those 30 are rejected as making an intercalary Month, and only the Excess of the Epact above 30 is accounted the true Epact for that Year. Thus when the Epact would amount to 31, 32, 33, 34, &c. the 30 is rejected, and the Epact becomes 1, 2, 3, 4, &c.

Since therefore the Lunar Year will have lost a Day more than ordinary, in respect of the Solar Year, whenever it is necessary to set the Golden Numbers one Day back, as was, before observed; it follows, that the Epact must at the same time be increased by an Unit more than usual; the Difference betwixt the Solar and the Lunar Year, having been just 10

much greater than usual. That is, 12 must be added, instead of 11, to the Epact of the preceding, in order to form what will be the Epact of the then present Year. Which Addition of an Unit extraordinary to one Epact will occasion all the subsequent Epacts (which will follow each other in the usual manner, each exceeding the foregoing by 11) to be greater by an Unit than their respectively corresponding Epacts of the preceding 19 Years.

If therefore, instead of the Golden Numbers, the Epacts of the several Years were prefixed, in the manner the *Gregorians* have done, to the Days of the Calendar, in order to denote the Days on which the New Moons fall in those Years whereof those Numbers are the Epacts; there would never be Occasion to shift the Places of those Epacts in the Calendar; since the Augmentation by an Unit extraordinary of the Epacts themselves would answer the Purpose, and keep all tolerably right.

Thus in a very easy Method may the Course of the New Moons be pointed out, either by the Golden Numbers, or by the Epacts, according to the *Julian* Account or Manner of adjusting the Year, which goes on regular and uniform without any Variation.

But the regulating these things for those who use the *Gregorian* Account, is an Affair of more Intricacy; and for them it will require more Consideration to determine, when the Epacts are to be more than ordinarily augmented, and at what Times they are to continue in their usual Course; nay, to know when they are not only not to be extraordinarily augmented, but also when they are to be diminished by an Unit, by increasing one of them by 10 only instead of 11 as usual: and this happens much oftener with the
Gregorians,

Gregorians, than the increasing one of them by 12 instead of 11. For, in every *Gregorian* Solar Year, whose Date consists of any Number of entire Hundreds not divisible by 4, it is supposed that the Equinox has anticipated one whole Day; and therefore one Day, that which ought to be the intercalary one, is omitted; and consequently the preceding Solar Year, where one Day was lost, exceeded the Lunar Year by 10 Days only instead of 11.

In order therefore to adapt the before-mention'd Rule to the *Gregorian* Account, and to know in what Years the Epacts should either be extraordinarily augmented or diminished, and the Golden Numbers should either be set backwards or forwards in the Calendar; the following Rules and Directions must be observed.

First. That in the Years 1800, 2100, 2700, 3000, &c. where the Number of entire Hundreds is divisible by 3, but not by 4, the *Gregorian* Solar, as well as the Lunar Year, will have lost a Day; and consequently the Difference betwixt them will be the same as usual: Therefore in those Years there must be no Alteration, either in the Epacts or the Golden Numbers; but the former must go on in the same manner, and the latter stand prefixed to the same Days in the Calendar, for another, as they did for the last hundred Years.

2dly. The like will happen in the Years 2000, 2800, 3200, &c. where the Number of entire Hundreds is divisible by 4, but not by 3: For neither the *Gregorian* Solar nor the Lunar Year is to be altered; and therefore the Epacts must go on, and the Golden Numbers stand, as they did before.

But,

But, 3dly, In the Years 2400, and 3600, whose Number of entire Hundreds is divisible both by 3 and 4, the *Gregorian* Solar Year goes on as usual, and the Lunar Year has lost a Day. The Difference therefore betwixt them being 12, the Epact of the preceding Year must be augmented by that Number instead of 11, in order to form the Epact of the then present Year; whereby a new Set of Epacts will be introduced, exceeding their precedent corresponding Epacts by an Unit: And the Golden Numbers must be set one Day back in the Calendar.

4thly and lastly, In the Years 1900, 2200, 2300, 2500, &c. where the Number of Hundreds is divisible neither by 3 nor 4; the *Gregorian* Solar Year having lost one Day, and the Lunar none, the Difference betwixt them being only 10; that Number only, and not 11, is to be added to the Epact of the preceding, in order to form the Epact of that, the then present Year; whereby a new Set of Epacts will be introduced, all of them less by an Unit than their precedent corresponding Epacts: And the Golden Numbers must be set a Day forwarder in the Calendar; that is, be prefixed to the Day following that, against which they stood in the precedent hundred Years.

This Method would preserve a sort of Regularity betwixt the Solar and the Lunar Years; and, by means of the Rules and Directions before-mentioned, the Days of the New Moons might be pointed out, either by the Golden Numbers or by the Epacts, placed in the Calendar for that Purpose; according to the *Julian* Account for ever, and according to the *Gregorian* Account till the Year 4199 inclusive, after which

which there must be some little Variation made in the four last Precepts or Rules; but it would be to little Purpose now, to attempt the framing of a new Set of Rules for so distant a Time.

The *Gregorians* have chosen to make use of the Epacts to determine the Days of the New Moons, and follow pretty nearly the Rules prescribed above; except that they order the Epacts to have an additional Augmentation of an Unit eight times in 2500 Years, beginning with the Year 1800, as at the End of 400 Years; to which 400 Years if there be added three times seven hundred, or 2100 Years, the Period of 2500 Years will be completed in the Year 3900. After which they do not make their extraordinary Augmentation of an Unit in the Epacts, till at the End of another Term of 400 Years; which defers that Augmentation from the Year 4200 to the Year 4300. And this is the Reason that the Rules above deliver'd will require a Variation in the Year 4200; whereas it is directed in this Paper that the Epacts should be augmented, or (which is the same thing) the Golden Numbers be set back in the Calendar nine times in 2800 Years. This arises from the *Gregorians* supposing, that the Difference betwixt 19 Solar and as many Lunar Years would not amount to a whole Day in less than 312 Years and a half; whereas it has appeared above, that it would amount to a whole Day in 310.7 Years. But although the Rule prescribed in this Paper comes much nearer to the Truth, yet the Error in either Case is very inconsiderable, being so small as not to amount to a whole Day in many thousand Years; and therefore is not worth regarding.

A Method of finding the Time of Easter, as it is observed in most Parts of Europe.

From what has been already said, a Method may be obtained, for fixing, with sufficient Exactness, the Time of the Celebration of the Feast of *Easter*, which is governed by the *Vernal Equinox*, and by the Age of the Moon nearest to it. The former whereof, when once rightly adjusted, may (by the Corrections mentioned in that Part of this Paper which relates to the Solar Year) be made to continue to fall at very near the same time with, or at most not to differ a whole Day from the true *Equinox*: and the same Rules and Directions, which, as was before shewn, would, without any great Error, point out the Times of the first Day of the Moon, would with equal Certainty point out the fourteenth, fifteenth, or any other: And thus the Times of the Oppositions or the Full Moons might be as well marked out thereby, as those of the Conjunctions or the New Moons.

I shall not at present take notice of the Canon of the Council of *Nice*, in the Year of our Lord 325, which directs the Time of celebrating the Feast of *Easter*, or of the Reasons upon which that Canon was founded. Nor shall I endeavour to explain the Rule now in Use in the Church of *England* for finding *Easter*: For, besides that such an Explanation would extend this Paper to an improper Length, those Points have already been treated of by several much abler Hands, and particularly by our Countryman the learned Dr. *Prideaux*. Nor is it my Intention to enter far into
the

the Methods used by the *Gregorians*, or those of the Church of *Rome*, or by any other Nations or Countries, for finding the Time of that Feast. As to our own, I shall only observe, that the Method now used in *England*, for finding the fourteenth Day of the Moon, or the Ecclesiastical Full Moon, on which *Easter* dependeth, is, by Process of Time, become considerably erroneous: as the Golden Numbers, which were placed in the Calendar, to point out the Days on which the New Moons fall in those Years of which they are respectively the Golden Numbers, do now stand several Days later in the same than those New Moons do really happen. Which Error, as was before observed, arises from the Anticipation of the Moons since the Time of the Council of *Nice*: And as the *Vernal Equinox* has also anticipated eleven Days since that time; neither that Equinox, nor the New Moons, do now happen on those Days upon which the Church of *England* supposes them so to happen.

When Pope *Gregory XIII.* reformed the *Julian* Solar Year, he likewise made a Correction as to the Time of celebrating the Feast of *Easter*, by placing the Epacts (which he directed to be made use of for the future instead of the Golden Numbers) much nearer to the true Times of the New Moons than the Golden Numbers then stood in the old Calendar: I say, *much nearer to the true Times*; because in fact the Epacts, as placed by him, were not prefixed to the exact Days upon which the New Moons then truly fell. And this was done with Design, and for a Reason which it is not material to the Purpose of this Paper to mention.

But the Church of *England*, and that of *Rome* or the *Gregorians*, do still agree in this; that both of them mark (the former by the Golden Numbers, and the latter by the Epacts corresponding to them) the Days on which their Ecclesiastical New Moons are supposed to happen: And that fourteenth Day of the Moon inclusive, or that Full Moon, which falls upon, or next after, the 21st Day of *March*, is the Paschal Limit or Full Moon to both: And the *Sunday* next following that Limit or Full Moon, is by both Churches celebrated as *Easter Day*. But the 21st of *March* being reckoned, according to the *Gregorian* Account or the New Style, eleven Days sooner than by the *Julian* Account or the Old Style, which is still in Use among us; and their Ecclesiastical New Moons being three Days earlier than those of the Church of *England*; it happens that although the Church of *England* and that of *Rome* often do, yet more frequently they do not, celebrate the Feast of *Easter* upon the same natural Day.

It might however be easier for both, and could occasion no Inconvenience, now that Almanacks, which tell the exact Times of the New Moons, are in most Peoples Hands; if all the Golden Numbers and Epacts now prefixed to those Days of the Calendar, in our Book of Common Prayer, and in the *Roman Breviary*, on which the respective Ecclesiastical New Moons happen, were omitted in the Places where they now stand; and were set only against those fourteenth Days of the Moon, or those Full Moons, which happen betwixt the 21st Day of *March* and the 18th of *April*, both inclusive. Since no fourteenth Day or Full Moon, which happens before the 21st
of

of *March*, or after the 18th Day of *April*, can have any Share in fixing the Time of *Easter*. By which means the Trouble of counting to the fourteenth Day, and the Mistakes which sometimes arise therefrom, would be avoided.

We do as yet in *England* follow the *Julian* Account or the Old Style in the Civil Year; as also the Old Method of finding those Moons upon which *Easter* depends: Both of which have been shewn to be very erroneous.

If therefore this Nation should ever judge it proper to correct the Civil Year, and to make it conformable to that of the *Gregorians*, it would surely be advisable to correct the Time of the Celebration of the Feast of *Easter* likewise, and to bring it to the same Day upon which it is kept and solemnized by the Inhabitants of the greatest Part of *Europe*, that is, by those who follow the *Gregorian* Account. For tho' I am aware, that their Method of finding the Time of *Easter* is not quite exact, but is liable to some Errors; yet I apprehend, that all other practicable Methods of doing it would be so too: And if they were more free from Error, they would probably be more intricate, and harder to be understood by Numbers of People, than the Method of determining that Feast either by a Cycle of Epacts, as is practised by the *Gregorians*, or by that of 19 Years or the Golden Numbers, in the manner proposed in the following Part of this Paper: And it is of no small Importance, that a Matter of so general a Concern, as the Method of finding *Easter* is, should be within the Reach of the Generality of Mankind, at least as far as the Nature of the thing will admit.

For which Reason, in case the Legislature of this Country should before the Year 1900, think fit to make our Civil Year correspond with that of the *Gregorians*, and also to celebrate all the future Feasts of *Easter* upon the same Days upon which they celebrate them; this last Particular might be easily effected, without altering the Rule of the Church of *England* for the finding of that Feast: And this only by advancing the Golden Numbers, prefixed to certain Days in the Calendar, 8 Days forwarder for the New Moons, or 21 Days forwarder for the fourteenth Days or Full Moons, than they now stand in our Calendar.

In order to explain this, it must be observed, that the *Gregorian* Account or the New Style is eleven Days forwarder than the *Julian* Account or the Old Style, which we still make use of; that is, the last Day of any of our Months is the eleventh Day of their next succeeding Month. If therefore their Ecclesiastical New Moons fell on the same Days with those of the Church of *England*, the Golden Number 14, which now stands against the last Day of *February* in our ~~that~~ is the *Julian* Calendar, should, when we should have adopted the *Gregorian* Calendar, be prefixed to the 11th Day of *March*. But since their Ecclesiastical New Moons happen 3 Days earlier than our Ecclesiastical New Moons at present do; so much should be deducted from those 11 Days, by which the Golden Numbers ought otherwise to be advanced; and the Golden Number 14 should not be placed against the 11th, but the 8th Day of *March*: Which being reckoned the first Day of the Moon, if we count on to the fourteenth Day of the same inclusive, that would be found to fall on the 21st Day of *March*; on which
Day

Day the *Gregorian* Paschal Limit or Full Moon will happen when the Golden Number is 14. And the like Course should be taken with the rest of the 19 Golden Numbers; which ought to be placed 8 Days forwarder than they now stand, if they are to point out the New Moon; or 21 Days forwarder than they are at present, if they are to mark the fourteenth Day of the Moon or the Full Moon: The latter of which, as has been shewn, would be more eligible, than to prefix those Numbers to the Days on which the New Moons happen.

Thus may the Rule and Method now used in the Church of *England*, be most easily adapted to shew the Time of *Easter*, as it is observed by the *Gregorians*, till the Year 1900; at which Time, and at the other proper succeeding Times, if the Golden Numbers in the Calendar shall either be advanced or set backward a Day, according to the foregoing Rules and Directions for that Purpose, they will continue to shew us the New or the Full Moons of the Church of *Rome* or the *Gregorian* Calendar with great Exactness, till the Year 4199: when, as has been already mentioned, there must be a little Variation made in those Rules and Directions.

There is however one Exception to those General Rules and Directions, which will be taken notice of in the next Paragraph.

Upon these Principles I framed the Table accompanying this Paper, and shewing, by means of the Golden Numbers, all the *Gregorian* Paschal Limits or Full Moons, from the Reformation of the Calendar, &c. by Pope *Gregory* to the Year 4199 inclusive. Which Space of Time is therein divided into sixteen unequal Portions or Periods; at the Beginning of

each of which, all the Golden Numbers, when once they shall have been properly placed in the Calendar, must either be advanced or set back one Day, with respect to the Place where they stood in the preceding Period, agreeably to the foregoing Rules: Except those Numbers which shall happen to stand against the 4th and 5th of *April* to shew the Paschal New Moons, or against the 17th and 18th of the same Month to mark out the Paschal Full Moons; both which Numbers at some Times, and only one of them at others, must keep the same Place for that, which was allotted to them in the immediately preceding Period.

In order to determine at what Times, and on what Occasions, this Exception is to take Place; let it be observed, that, in the Months of *January, March, May*, and some others in our present Calendar, as well as in the Table above-mentioned, some of the Golden Numbers stand double or in Pairs, and follow one the other immediately; whilst others, on the contrary, generally stand single and by themselves.

Now, when any of those Pairs, or two Numbers which usually accompany each other, happen, in pursuance of the foregoing Rules, to be prefixed the one to the 4th and the other to the 5th of *April* for the New Moons, or the one to the 17th and the other to the 18th of *April* for the Paschal Limits or Full Moons: And when any of those Numbers, which generally stand single, are prefixed, according to the said Rules, to the 5th of *April* for the New Moons, or to the 18th for the Full Moons: In these Cases those Pairs or single Numbers that are so situated, must not be set forward or advanced at the Beginning

ning of the next Period, but must keep their Places during another Period, if the foregoing Rules direct all the Golden Numbers to be advanced a Day ; which must be complied with in respect to all the other Golden Numbers, except those so situated as above. Instances whereof may be seen in the Table, under the respective Periods beginning with the Years 1900, 2600, 3100, and 3800.

But if, in Conformity to the foregoing Rules, all the Golden Numbers are to be set one Day backward ; those Pairs or single Numbers, tho' situated as is above-mentioned, must not keep their Places, but must move one Day backward like all the other Golden Numbers ; as they may be seen to do in the Periods beginning with the Years 2400 and 3600.

To give a plain and intelligible Account of the Reason, on which the Directions now given with respect to this Exception are founded, would extend this Paper, already too long, far beyond its due and proper Bounds. I shall therefore content myself with observing, that it depends chiefly upon the Nature of the *Menses Pleni* and *Menses Cavi*, into which the Lunar Year is usually divided : and that, in order to make use of the Golden Numbers for finding the Time of the *Gregorian Easter*, it will be necessary not only to conform to the general Rules laid down in the former Part of this Paper ; but also to follow the Directions just now given, with respect to the above-mentioned Exception to those general Rules.

But I should not do Justice to *Peter Davall*, of the *Middle Temple*, Esq; Secretary of the *Royal Society*,

Society, did I not here acknowledge, that, before I had so fully considered these Matters as I have since done, I had the first Hint of applying the Golden Numbers to find the *Gregorian* Paschal Limit or full Moon, from him ; who has since that time composed and drawn up Tables, &c. which may possibly be of considerable and general Use in this Nation hereafter.

A TABLE, shewing, by means of the Golden Numbers, the several Days on which the Paschal Limits or Full Moons, according to the *Gregorian* Account, have already happened, or will hereafter happen; from the Reformation of the Calendar in the Year of our Lord 1582, to the Year 4199 inclusive.

To find the Day on which the Paschal Limit or Full Moon falls in any given Year: Look, in the Column of Golden Numbers belonging to that Period of Time wherein the given Year is contained, for the Golden Number of that Year; and against it, in the same Line continued to the Column intituled *Paschal Limits or Full Moons*, you will find the Day of the Month, on which the Paschal Limit or Full Moon happens in that Year. And the *Sunday* next after that Day is *Easter* Day in that Year, according to the *Gregorian* Account.

Golden Numbers from the Year 1583 to 1699, and so on to 4199, all inclusive.																Paschal Full Moons.
1583	1700	1900	2100	2200	2300	2400	2500	2600	2900	3100	3400	3500	3600	3700	3800	Days of the Month, and Sunday Letters
to 1699	to 1899	to 2099	to 2299	to 2499	to 2699	to 2899	to 3099	to 3299	to 3499	to 3699	to 3899	to 4099	to 4299	to 4499	to 4699	March 21. C
3	14	14	6	17	6	14	17	16	9	9	1	12	1	12	1	4
11	11	14	14	14	14	14	14	14	16	17	9	9	9	9	9	12
19	19	11	11	11	11	11	11	11	14	14	14	14	17	17	17	9
16	16	19	19	19	19	19	19	19	11	11	14	14	14	14	14	17
13	13	16	16	16	16	16	16	16	11	11	11	11	11	11	11	16
10	10	13	13	13	13	13	13	13	18	18	18	18	18	18	18	14
18	18	10	10	10	10	10	10	10	16	16	16	16	16	16	16	11
15	15	18	18	18	18	18	18	18	13	13	13	13	13	13	13	18
12	12	15	15	15	15	15	15	15	10	10	10	10	10	10	10	16
9	9	12	12	12	12	12	12	12	18	18	18	18	18	18	18	13
17	17	9	9	9	9	9	9	9	15	15	15	15	15	15	15	10
14	14	17	17	17	17	17	17	17	12	12	12	12	12	12	12	17
11	11	14	14	14	14	14	14	14	9	9	9	9	9	9	9	14
18	18	11	11	11	11	11	11	11	16	16	16	16	16	16	16	11
15	15	18	18	18	18	18	18	18	13	13	13	13	13	13	13	18
12	12	15	15	15	15	15	15	15	10	10	10	10	10	10	10	16
9	9	12	12	12	12	12	12	12	18	18	18	18	18	18	18	13
17	17	9	9	9	9	9	9	9	15	15	15	15	15	15	15	10
14	14	17	17	17	17	17	17	17	12	12	12	12	12	12	12	17
11	11	14	14	14	14	14	14	14	9	9	9	9	9	9	9	14
18	18	11	11	11	11	11	11	11	16	16	16	16	16	16	16	11
15	15	18	18	18	18	18	18	18	13	13	13	13	13	13	13	18
12	12	15	15	15	15	15	15	15	10	10	10	10	10	10	10	16
9	9	12	12	12	12	12	12	12	18	18	18	18	18	18	18	13
17	17	9	9	9	9	9	9	9	15	15	15	15	15	15	15	10
14	14	17	17	17	17	17	17	17	12	12	12	12	12	12	12	17
11	11	14	14	14	14	14	14	14	9	9	9	9	9	9	9	14
18	18	11	11	11	11	11	11	11	16	16	16	16	16	16	16	11
15	15	18	18	18	18	18	18	18	13	13	13	13	13	13	13	18
12	12	15	15	15	15	15	15	15	10	10	10	10	10	10	10	16
9	9	12	12	12	12	12	12	12	18	18	18	18	18	18	18	13
17	17	9	9	9	9	9	9	9	15	15	15	15	15	15	15	10
14	14	17	17	17	17	17	17	17	12	12	12	12	12	12	12	17
11	11	14	14	14	14	14	14	14	9	9	9	9	9	9	9	14
18	18	11	11	11	11	11	11	11	16	16	16	16	16	16	16	11
15	15	18	18	18	18	18	18	18	13	13	13	13	13	13	13	18
12	12	15	15	15	15	15	15	15	10	10	10	10	10	10	10	16
9	9	12	12	12	12	12	12	12	18	18	18	18	18	18	18	13
17	17	9	9	9	9	9	9	9	15	15	15	15	15	15	15	10
14	14	17	17	17	17	17	17	17	12	12	12	12	12	12	12	17
11	11	14	14	14	14	14	14	14	9	9	9	9	9	9	9	14
18	18	11	11	11	11	11	11	11	16	16	16	16	16	16	16	11
15	15	18	18	18	18	18	18	18	13	13	13	13	13	13	13	18
12	12	15	15	15	15	15	15	15	10	10	10	10	10	10	10	16
9	9	12	12	12	12	12	12	12	18	18	18	18	18	18	18	13
17	17	9	9	9	9	9	9	9	15	15	15	15	15	15	15	10
14	14	17	17	17	17	17	17	17	12	12	12	12	12	12	12	17
11	11	14	14	14	14	14	14	14	9	9	9	9	9	9	9	14
18	18	11	11	11	11	11	11	11	16	16	16	16	16	16	16	11
15	15	18	18	18	18	18	18	18	13	13	13	13	13	13	13	18
12	12	15	15	15	15	15	15	15	10	10	10	10	10	10	10	16
9	9	12	12	12	12	12	12	12	18	18	18	18	18	18	18	13
17	17	9	9	9	9	9	9	9	15	15	15	15	15	15	15	10
14	14	17	17	17	17	17	17	17	12	12	12	12	12	12	12	17
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12	12	15	15	15	15	15	15	15	10	10	10	10	10	10	10	16
9	9	12	12	12	12	12	12	12	18	18	18	18	18	18	18	13

VI. *An Account of the Morbus Strangulatorius, communicated in a Letter from John Starr, M. D. to C. Mortimer, M. D. Secret. R. S. &c.*

S I R,

Luskard, Jan. 10. 1749.

Read May 24.
1750.

IT is not, I'll assure you, an Itch for Scribbling, but the Concern I feel in my own Breast for the Happiness and Well-being of my Fellow-Creatures, which has occasioned my sending you the Papers, which this accompanies. We have had ravaging among us for some time, at certain Seasons, a Disease formidable in its Advances, and fatal in its Consequences, I mean an occult *Angina*, called with some Propriety *Morbus Strangulatorius*. Dr. *Fothergil's* sore Throat with Ulcers, and Dr. *Cotton's* St. *Alban's* scarlet Fever, &c. are in my Opinion but its Shadows. None practising in those Parts have reason to boast their Success in attempting its Cure. The Way to cure Disorders is first to know them. Where the Deviations of Nature are hidden, where we cannot discern how and in what manner the distressed Functions suffer, the Art of Healing must have its Difficulties. The sudden, and indeed unexpected Death of some Patients greatly alarmed me. I concluded the Cause deeper than at first imagined. The Case herewith sent, confirms my Conjecture. It is extraordinary and uncommon. Does medical History afford its like? It is possible it may, but it has not yet fallen within the Compass of

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my Reading, or Study. *Tulpius's* Observation, *Lib. iv. Cap. ix.* falls vastly short of it.

The Figures (*see* TAB. I. *Fig* 1. 2.) I. have sent in order to give you clear and just Ideas of the Case, are drawn with great Truth and Exactness. Should Vouchers be necessary for a Confirmation of the Fact, I can send you many. But I am satisfied Dr. *Mortimer* will scarce think me capable of attempting an Imposition on Mankind in so important an Affair.

I have been, I own, somewhat prolix: If you think the Whole, or any Part, worthy Publication, you are at Liberty to treat it in the Manner that is most agreeable. I should be glad from the Premises to see a rational Method of attempting a Cure pointed out. I please myself with believing you have not quite forgot me, when I add, that I am,
with great Regard,

S I R,

Your most humble Servant,

JOHN STARR.

THE *Morbus Strangulatorius*, with great Propriety and Justice thus denominated, has within a few Years reigned in several Parts of *Cornwall* with great Severity. Many Parishes have felt its Cruelty, and whole Families of Children, whence its contagious Nature is but too evident, have, by its successive Attacks, been swept off. Few, very few, have escaped.

I do not propose to send you an accurate History of this Disorder. This I cheerfully leave to such Gentlemen as have been more conversant in Practice among us, and whose Penetration, and Judgment,
are

are undoubtedly far superior to mine. However, as the Observations these Papers contain are in themselves just, honestly, and truly, tho' with great Plainness and Simplicity, related, so they are not perhaps unworthy the Knowledge of the Public, and Consideration of even the greatest in the Profession.

It is enough to say, that the Disorder does not appear with the same Train of Symptoms in every Subject. On the contrary, a vast Difference is observable; but then, whatever, or how various soever, the Symptoms may be, there is a certain Degree of Malignity, or (which is what I mean) there are Signs of a putrid Disposition of the Juices, in all.

Some, I am informed, have had corrosive Pustules in the Groin, and about the *Anus*, eating quick and deep, and threatening Mortification, even in the Beginning. Others after a few Days Illness have had Numbers of the worst and deepest *Petechiæ* break out in various Parts of their Body. Such I have not seen.

Many on the first Attack have complained of Swellings of the Glands, as Tonsils, Parotids, submaxillary and sublingual Glands, but frequently of no great Importance. A few, from an internal Tumor, have had a large external oedematous Swelling of the subcutaneous and cellular Tunic, from the Chin down to the Thyroid Gland, and up the Side of the Face. One such I was concerned with, the Tumor broke in the *Flaunces*; but, instead of a laudable Pus, some Ounces of a Coffee-coloured exceedingly fetid Matter were spit off. The Man recovered. As Respiration only suffered here by

Pressure, I should rather choose to call this a malignant *Angina*, than the true *Morbus Strangulatorius*.

Not a few early in the Disorder have had gangrenous Sloughs formed in their Mouths, and perhaps so early in some, that the Disorder was scarce complained of, till the Slough was formed, so quick has it been in its Progress.

Others again, without any of the preceding Symptoms, have only complained of a slight Pain in swallowing, succeeded with a hot Flesh, feverish Pulse (never quick and weak, but as to the Stroke quick, and sufficiently full and strong), a short, low, heaving, hoarse Cough (the Patient generally so hoarse as to be difficultly understood after a Day or two's Illness), which, sooner or later, for I never could observe any certain Period, was productive of a difficult, noisy, and strangulating Respiration.

These Last, especially the Former of them, I esteem as the pathognomonic Symptoms of the real *Morbus Strangulatorius*: The above-mentioned are rather *Symptomata Causæ, quam Morbi*.

I have not mentioned a *Fætor Oris*, which, when it happens, is usually an early Symptom, because, tho' some have had it, others have had it not.

This Respiration, however agonizing it appears, has, especially in the Beginning, its Remissions, and Exacerbations. Its Cause cannot of course be permanent. I take it to be owing to a Lodgment of some Matter in or about the *Glottis*, and *Larynx* thro' which the inspired Air is obliged to pass: While this Matter is capable of being expectorated, and happens to be coughed off, the Breathing for a time becomes free, and the Patient is delivered from the
 utmost

utmost seeming Distress; but, on its Recollection, which, if the Progress of the Disorder cannot be stopt, never fails to happen, this Symptom again occurs, and the Patient either dies suddenly, or, being worn out, or quite dispirited, sinks away gradually, or, falling into Convulsions, in these expires.

I was called to a Girl of five Years old. Her Tongue was quite clean; she could move it every way as in Health. Nothing morbid was seen in her Mouth, or indeed *Fauces*: She had a trifling Pain in swallowing (it was felt on depressing the *Epiglottis* for the passing the Bole), not sufficient to prevent her from eating Bread and Butter, Biscuit, Figs. It was on the 4th Day of her Disorder, she had the strangulating Respiration, with a Cough exceeding hoarse. After the Use of a stimulating Gargle, &c. her Cough became stronger, and she threw off a large Quantity of white rotten Flesh, or Membranes, mixt with a slimy adhesive Matter; her Respiration became so easy, that she seemed to ail nothing. In three Hours it grew again difficult, and gradually increased till it arrived at its former Violence. Those about her fancied there was somewhat in the Passage which ought to come off: The Child gargled, and provoked her Cough as far as she was able, but in vain. Her Agonies increasing, she said, as well as she was able, I shall be choaked, and in a few Minutes died. This Case shocked me, being satisfied, that somewhat very extraordinary and uncommon could only occasion so sudden, and to Appearance, violent a Death.

I have frequently examined the Matter those Patients have at times spit. Tho' there was some Difference

Difference in various Subjects, yet I never once saw a well-digested or concocted Phlegm, or *Mucus*, on the contrary, the greatest Part was of a Jelly like Nature, glary, and somewhat transparent, mixt with a white opaque thready Matter, sometimes more, sometimes less, resembling a rotten membranous Body or Slough.

Such a Slough I have seen generated on the Skin of one of these Patients in the Neck and Arm, where Blisters had been before applied. The Blisters had been dressed with Colewort-leaves, and ran but little; but, contiguous to them, small red Pustules, not exceeding fiery, arose, which, sweating plentifully in a few Hours, became quite white: These, hourly enlarging their Bases, united, and covered a large Surface, fresh Pustules arising in the adjacent Parts. This white Surface had the Aspect of an oversoaked Membrane, which, being oversoaked, was become absolutely rotten. The Part blistered, if not quite, was in Effect dry, and the Flux from the Slough was incredibly great. If I mistake not, Cloths ten times double, the Child's Shift, a double Bed-gown, were wet quite through, and a large Spot was seen in the Bed of some Hands Breadth; and this in a very few Hours. I scratched the Slough with my Nail; it separated with Ease, and without being felt by the Child. What my Nail took off afforded the same Appearance with the Matter of the Spittle before-mention'd. Hence, I thought, I saw sufficient Reason to convince me that the Disorder in the *Larynx* and *Aspera Arteria* was similar to this, generated in the same manner, and arising from the same internal Cause: And supposing this Conjecture true, the
 Production

Production of every Symptom seems easy to be accounted for.

In Dec. 1748, while the *Morbus Strangulatorius* was among us at *Liskard*, a Child here and there had red Pustules, not unlike the above, which broke out in the Nape of the Neck, and threw off a surprising Quantity of thin transparent Ichor, vastly glutinous when dry. These were easily cur'd in the beginning, if managed aright; but, being drawn with Colewort-leaves, or pulvis'd according to the Direction of our old Female Practitioners (too often the Case) the above-mention'd Slough was soon generated. I was desired to look on a poor Person's Child in this unhappy Situation, who, with little Intermision for I think near two Days, had bled profusely at the Nose; her Pulse was almost gone; the Bleeding was with Difficulty stop't; but, being quite exhausted, in about 6 Hours she sunk in a faint Fit. The Slough had spread from Shoulder to Shoulder, extended full a Third down her Back, and seem'd very thick. All treated in the above Manner died. Scarifying afforded no Relief.

Now, tho' this was not properly the *Morbus Strangulatorius*, yet I apprehend it was analogous to it, and produced from the same Cause; and it is likely, had the anatomical Knife been employed, what was seen on the Back of one, might have been discover'd in the *Asperia Arteria* of the other. There is a Circumstance which adds to the Probability of this Opinion, *viz.* in one or more Instances, these different Disorders appear'd in different Subjects, in the same Family, at the same time.

What

What I have hitherto said, does not, I own, demonstrate the Case to be as represented, but the following History throws the strongest Light on this dark, mysterious Affair, renders the Disorder, by its Consequences affrightful, even shocking to the Imagination, accounts for its too common Fatality, and must convince of the great Difficulty of the Cure, if in itself possible, unless attempted with Judgment in the very Beginning,

Dec. 11, 1749, I was call'd to the Son of Mr. *Kitto*, an honest and deserving Farmer in the Parish of *St. Eve*, a Lad aged 10 Years and an half. This was the 7th Day of his Illness.

His first Complaints were, a Pain in swallowing, not great; a Cough; hoarse, vexatious, like an incipient Catarrh, a Pain on coughing shot into his Ears. This was still felt at times; a thin Ichor ran from his Mouth in great Plenty, supposed to be a Quart, or three Pints daily. His Pain in swallowing was now so trifling, that I saw him drink a considerable Draught without removing the Vessel. He was now so hoarse that he could scarce be heard. His Cough was rough, low, short, and ineffectual; breath'd with much Straitness and Noise, especially in Inspiration; the Wheezing or Rattling might be heard at a great Distance, was always worse during a coughing Fit, or for a short time after. When he spit by the Cough, it was glary, but glutinous; a whitish rotten sort of Stuff would sometimes accompany it; its Quantity never great.

Examining his Mouth, he could move his Tongue every Way without the least Pain; forward it was clean, but behind a little furr'd. Depressing it with

a *Spatula*, a white Body was seen on the *Velum pendulum palatinum* and Tonsils. I desired Mr. *Scotchburn*, a Surgeon present, to examine with his *Forceps*, if this Body adher'd. firmly to the *Velum*, or was loose; on Trial he found it strongly adher'd. The Lad complain'd of no Pain on his taking hold of it. The circumambient Parts of a somewhat deeper Red than natural; his Breath stinking, and highly offensive.

He was but little thirsty; Pulse quick, but sufficiently strong; slept but little; what Sleep he had was disturb'd; he breath'd much better up than in Bed; here he was always in Danger of Suffocation, and fear'd it.

After pronouncing a Prognostic disagreeable to myself, and all concerned, I order'd the Slough, as I then thought it, to be well rubb'd once in three Hours with a Mixture equated with *Spir. Sal. marin.* by means of a Silver Probe, lined with Cotton, after which, an astringent, detergent, antiseptic Gargle was to be frequently us'd, and a cordial Mixture to be taken at proper Intervals.

After rubbing with the Probe, &c. twice, and gargling often, in a violent Fit of Coughing with a deal of slimy filthy Stuff from the Pipe of the Lungs, the Membrane (TAB. I. Fig. 1.) separated from the *Velum Palatinum*.

It was really the external and mucous Coat of the Part, was not rotten like a Slough, but retained, tho' dead, its membranous Structure, was strong, would bear handling, and stretching without breaking. It was at first thick (as near as I could guess from a Bit remaining on the right Side of the *Uvula*) parted

from the Hollow (*a*) in the Figure, of about the Third of a Barley-corn in Length) having its Fibres and Cavities soak'd with a very viscid and slimy Matter, which, by washing in Water, leak'd off, when the Membrane became evidently thinner.

The Lad immediately, as I was told, breath'd better, without that Noise and Wheezing heard before, and was less hoarse; nor, I am satisfied, from the Separation of the Membrane, but from that Load of Filth discharg'd at the same Point of Time from the distress'd respiratory Passages.

But, as usual, this Relief did not prove lasting. In an Hour and half the noisy Respiration began anew, his Hoarseness increased, and his Cough, tho' short and low, was busy and vexatious; now he appear'd as if quite-strangled, -and in the Agonies of Death; now he would again revive; for a few Days he was interchangeably in these different States; at length his Father perceiving somewhat in his Mouth, which he thought thick Phlegm, thrust in his Finger and Thumb, and, taking hold of it, drew it out. It was a hollow Bag, as he thought, filled with Rot and Corruption, for a considerable Quantity run out of it. It was, when full, he said, as big as his Thumb, and of many Inches in Length. The Agonies of the Child, during these Moments, were not to be express'd; his Face was livid or black; but, being freed from this Burthen, he soon reviv'd, smil'd, and said, now I am easy. Being put to Bed, he soon slept, and continued to have short Naps for two Hours.

I got to the House, being sent for in the Beginning of the Lad's Extremity, a few Minutes after the Affair was thus concluded. The Account greatly surprised

prised me; but I was more surpris'd, when, on Sight, I found the supposed Bag was the mucous Coat of Part of the *Larynx*, the whole *Aspera Arteria*, with the grand Division of the bronchial Ramifications. I spread it on Paper, for the Convenience of Carriage, being some Miles from home, and thence took its Likeness with great Exactness, as here sent you, TAB. I. *Fig. 2.* There was somewhat bloody visible about its Middle. It was more rotten and tender than the former, also somewhat thicker, excepting where it belonged to the Branches of the *Bronchia*. What sweated from it was as sticking as Bird-lime. . . It was probable this morbid Affection ran thro' the whole *Bronchia*; for the Ends plainly discover'd a Laceration; consequently much more remain'd to be separated and discharg'd.

He now complain'd of Soreness in the Pipe, and pointed to the first and second *Costa*, as the Place of its Termination. His Inspiration was now free, soft, but short: His Pulse was become a little more frequent and weaker.

Examining his Mouth, no Ulcer or Wound was discernible in that Part of the *Velum*, &c. to which *Fig. 1.* adher'd. 'Twas smooth, clean, and look'd only like a new Skin not quite harden'd.

While I was in the House, he spit off another Membrane of an irregular Figure, thinner than either of the former, but more than sufficient to cover a Crown-Piece. It came from the *Fauces*.

After this I was inform'd he brought off, with Difficulty another tubular Membrane of some Length; and whenever he had Strength to expectorate, little

Bits of the same were observed mix'd with a very slimy *Mucus*.

He liv'd 27 Hours after the second Coat was drawn from him, and died in the End somewhat suddenly, tho' in his perfect Senses. I must add, that I never saw one in this Disorder attack'd with a *Delirium*.

VII. *An Examination of the Strength of several of the principal purging Waters, especially of that of Jessop's Well; by the Rev. Stephen Hales D. D. & F. R. S. communicated in a Letter to Cromwell Mortimer M. D. Secr. R. S. with a Letter from Swithin Adee M. D. F. R. S. to Dr. Hales, on the Virtues of the said Well.*

An Account of the several Quantities of Sediment which were found in a Pound Averdupois of the following purging Waters, evaporated away to Dryness, in Florence Flasks, cut to a wide Mouth; viz.

		Grains
Read May 24. 1750.	1. Marybon-Fields near London	24
	2. Peterstr. Brew-holse Westm.	27
3. Ebsham	" " "	34
4. Scarborough,	" " "	40

And it was found nearly the same by Dr. Shaw and Dr. Short: A little more or less, according

according to the Wetness or Dryness of the Seasons $\frac{1}{3}$ of this in calcarious Matter; the rest, mostly what is called nitrous Salts, on account of the oblong Chrystals which it shoots into.

5. *Dog and Duck, Lambeth* - - - - - 40 $\frac{1}{2}$
6. *Kilburn, four Miles from London, in the Way to Edgwar* - - - - - 43
7. *Acton* - - - - - 44
8. *Cheltenham, Gloucestershire,* - - - - - 60

Dr. Short found the following Proportions in *Cheltenham Water*; viz.

Sept. 1738.	calcarious Sediment	$\frac{1 \frac{1}{2}}{10 \frac{1}{2}}$	of	74
Dec. 1738.	- - - - -	$\frac{1}{14}$	of	42
July 1739.	- - - - -	$\frac{1}{9 \cdot 8}$	of	70

He says it is the best and strongest nitro-calcarious Water in *England*, very bitter, having only a little subtil impalpable Earth mixed with its Salt.

9. *Cobham Well, a Mile South of Church Cobham, Surrey, once 68 Grains; another time 60 Grains* - - - - - 68
10. *Jessop's Well, on Stoke Common, in Mr. Vincent's Manor, about three Miles Southward of Claremont, Surrey, Sept. 11, 1749. after long dry Weather, 82 Grains in a Pound of the Surface-Water* - - - - - 82
October 16, after a considerable Quantity of Rain, the Surface-Water yielded but 66 Grains *Nov. 21, the Surface-Water yielded 65 Grains:*

This great Inequality of the Strength of the Surface-Water put me upon trying whether the Water at the Bottom of the Well, near the Springs, were stronger than the Surface-Water. And in order to this, I procured, *Dec. 11*, a Bottle of the Water near the Bottom, which was ten Feet below the Surface of the Water; which was done by tying an empty Bottle to the End of a long Pole, with a Line fixed to the Cork, to pull it out when at the Bottom, for the Water to fill it: And I had at the same time another Bottle full of the Surface-Water. The lower Water yielded 82 Grains; the Surface-Water but 48 Grains; and it was the same upon a second Evaporation of those Waters. Hence we see how much stronger the Water near the Bottom is, than at the Surface; even when the preceding Rains have been but moderate; for they had not as yet been sufficient to raise the Springs in this Country much. Hence we see that the stronger lower Water may easily be come at by means of a Pump; as also, that the upper Land-Springs, soon after Rains, make the Water near the Surface weaker: But, in long dry Weather, when there are no Land-Springs, the Surface-Water, and that at the Bottom, are nearly of an equal Strength: For it requires Time for the saline mineral Virtue to be equally diffused thro' a Mass of that Depth of Water, whose upper Part is incessantly weakened by a Land-Spring of fresh Water.

Hence we see how advisable it is, in order to keep out the Land-Springs, to dig a narrow Trench some Feet Depth, round the Well, to be filled with stiff Clay well rammed.

The

The mineral Virtue in this Water seems to be much like that of *Cheltenham*, in its shooting into very bitter, regular, oblong Chrystals, which are, on that account, called nitrous; tho' they are not a true Nitre; for neither these, nor those of *Cheltenham*, will deflagrate or flash in Touch-Paper, nor on burning Charcoal, as true Nitre will do; some of which still retain their Form and Firmness for 17 Months since they were chrystallized; whereas the chrystallized Salts of several other purging Waters have crumbled, and in a great measure wasted, away in much less Time: A greater Proportion of the Salts of *Jessop's Well*, shoot into oblong Chrystals than those of *Cheltenham*; and its Water also gives a stronger green Tincture, with Violet-flowers. The purging Quality resides chiefly in these chrySTALLINE Salts, and a small Proportion of common Salt; some of which there is in all these mineral Waters.

The Proportion also of its earthy calcareous Matter, is but $\frac{1}{14}$ Part of it; which, like that of *Cheltenham*, is but little, in comparison of the much greater Quantity of it in other purging Waters: It is also soft and impalpable, like that of *Cheltenham*, and not harsh and coarse, as it is in some other purging Waters.

And as the Quantity of purging Salt in this Water is considerably greater than in any other, so it is found by Experience, that, proportionably a less Quantity of it suffices, which makes it sit the better on the Stomach. It is also observed to exhilarate those who take it.

It was observable of the Sediment of several of these Waters, that, when dried, and while hot, there

there ascended Plenty of invisible volatile salt Fumes, so pungent that the Nose could not bear them. Hence we may reasonably conclude, that the Waters which abound most with purging Salts, such as those of *Jessop's Well*, should be proportionably preferable to weaker Waters, which are strengthened by boiling half away; whereby not only the more subtil active Parts are evaporated, and those that are left are de-compounded, and formed into new grosser Combinations; as are also the calcarious Particles, which are so fine as to pass the Filter before Evaporation, but not after it. This was the Reason which induced me to examine, by various repeated Trials, and to give an Account of the superior Strength of *Jessop's Well Water*, above all others that I have examined or heard of.

When *Jessop's Well* was cleaned, Oct. 16. 1749. after a considerable Quantity of Rain; after about half a Foot Depth of black muddy Filth was taken out, then the natural fat sandy-colour'd Clay-Bottom appear'd; thro' several Parts of which the Water quozed up at the Rate of 160 Gallons in 24 Hours.

The Water which then came fresh from the Spring gave a weak Blush with Galls; but when put into Bottles it did not do so next Day; a Sign that there is some Degree of Steel in it.

It was very observable, that the Man who stood about three Hours bare-legg'd in this Well-Water to clean it, was purged so severely for a Week, that he said he would not venture, on any account, thus to clean the Well again. And it was the same with another Man, who cleaned the same Well about twelve Years since. And I am credibly informed by

by a Merchant, that, being in a Warehouse in *Egypt* to see *Senna* baled up, it had the like purgative Effect on him.

In order to get a satisfactory Account of the Efficacy of these Waters, I desired Dr. *Adee* of *Guilford*, who has long prescribed them to his Patients, to give me his Opinion of them; which he has done in the following Letter; *viz.*

S I R,

Guilford, March 14, 1749.

I HAVE found very advantageous and uncommon Effects from the Use of the Waters of *Jessop's Well*. Some of my Patients who have drank them steadily and cautiously have been cur'd of obstinate Scurvies. As I had a long time ago Reason to think there was a fine volatile Spirit in them, I therefore oblig'd some to drink them for a Course of Time at the Well as an Alterative, with very happy Consequences. When I have order'd them as a Purge, they have work'd very smartly, but have not dispirited. I am glad to have it in my Power to confirm your Sentiments by my own Observations; and am satisfied these Waters, if continued a proper Time, and taken in a proper Manner, may be render'd very beneficial to Mankind, according to the best Opinion that can be formed by

S I R,

Your most faithful humble Servant,

Swithin Adee.

VIII. *An abstract of a Discourse intitled, Reflexions on the Medals of Pescennius Niger, and upon some Circumstances in the history of his Life ; written in French by Mr. Claude Gros de Boze, keeper of the Medals in the French King's Cabinet, etc. and sent by him to Dr. Mead, who communicated it to this Society. By John Ward, R. P. G. and F. R. S.*

Read May 31,
1750.

THE learned Author begins his Discourse with observing, that no medals of the Roman emperors, who reigned during the high empire, are more rare, than those of *Pescennius Niger* ; that they are somewhat scarcer in silver, than in brass ; and that it is the general opinion of antiquaries, there is not one extant in gold.

And tho *Anthony le Pois*, who lived about the middle of the sixteenth century, affirms in his posthumous book of *Antient medals* (1), that he had a *Pescennius* in gold, and also some other persons : yet he thinks, that as it is not known what became of those medals, they were counterseits ; of which sort he has seen several, which being cast from silver ones of that emperor, were afterwards repaired more or less artfully with a graver. He is likewise of the same opinion with regard to those, which have been collected by *Mediobarb* from other catalogues ; since
Mr.

(1) *Discours sur les Medailles antiques, etc. Paris. 1579. qu.*

Mr. *Vaillant*, the most knowing and experienced antiquary of the last age, in treating of the medals of this emperor sais expressly, *ex auro non observantur* (1); and Mr. *de la Bastie* has also remarked in his *Catalogue of the Roman emperors*, that notwithstanding what is said by *Anthony le Pois*, no medal of *Pescennius Niger* in gold is to be found in any known cabinet (2).

Sigismond Liébe, who in the year 1730 published the cabinet of the Duke of *Saxe Gotha*, under the title of *Gotha Numaria*, in order to prove it superior to that of the Duke of *Parma* published by Father *Pedrusi* (3), and equal at least to that of the antient Dukes of *Arschot* (4); has ranged the gold imperial medals of those three cabinets in three opposite columns: and when he comes to *Pescennius Niger*, he first remarks, that there is no gold medal of him in the cabinet of *Parma*; and then sais, that the ingraven one in the *Arschot* collection is generally acknowledged to be counterfeit and cast. He likewise declares his agreement with all other antiquaries, that there is no true one in gold; but, in order to render the comparison more complete, he has ventured to place a false one of *Saxe Gotha* against that of *Arschot*, because it was one of the first in the collection, and not disapproved of by Mr. *Morel* (5).

But

(1) *Numismat. Imp. Rom. præstantior.*

(2) *La science des Medailles*, Tom. II. p. 398. ed. 1739.

(3) See *Bandur. Bibl. Numar.* p. CVII.

(4) *Ibid.* p. XXXVII.

(5) *Goth. Num. cap. III. § 2. p. 49*

But notwithstanding this prevailing opinion Mr. *de Boze* sais, that for upwards of thirty years, in which he has had the keeping of the King's medals, he has not ceased to inquire a'ter a *Pescennius* in gold, as thinking it not impossible, but one might be found. Because, when a prince or general was proclaimed emperor, the first proof he gave of his authority, was to order gold or silver money to be struck as his coin in his own palace; the consent of the senate being only necessary for Latin brass coins, which were current at *Rome*, and required the usual signature S. C. for *Senatus consulto*.

In the years 1726 and 1727 he received accounts, as he sais, of one and the same gold medal of *Pescennius*, as brought from four different quarters; first from *Spain*, then from *Sicily*, afterwards from *Malta*, and lastly from *England*. But he found it to be false, as all others had done, who had seen it. It had been cast from a silver one of that prince, on the reverse of which is the figure of the goddess *Hope*; with the inscription of BONAE SPEI, which is the most common of any. Those in the cabinets of *Arschot* and *Saxe Gotha* have likewise the same reverse, and doubtless from the same origin.

About ten yeats afterwards a learned Englishman, who came from *Montpellier*, informed Mr. *de Boze*, that he had seen in a small collection of one Mr. *Veissières*, counsellor of the *Court of Aids*, two coins of *Pescennius* in gold; one of which was manifestly false, and the other deserved to be examined. Upon this information he applied himself to an eminent connoisseur (1), who viewed the two medals, as far

as

(1) *M. Bon, Premier President de la chambre des comptes, etc.*

as the delicacy of the owner would permit him; for he would not suffer them to be touched, as fearing lest some damage might insue from too near an inspection. However the Gentleman acquainted him, that they were both equally false; one being rough cast from a silver one, and the other carefully repaired, so as to give it some appearance of a genuine coin, when compared with the former, which it would not have, if viewed by itself: that the reverse was *BONAE SPEI*: and that such as they were, the owner would not part with them upon any consideration. But upon the death of Mr. *Veissières* the examination of those medals became more easy, and served only to confirm the judgement given of them; and the intire collection was sold for little more than the weight.

At length, in the month of July 1748, Mr. *de Boze* had fresh encouragement to pursue his inquiry; which he did with greater attention, and better success, than before. A barefooted *Carmelite* of the convent of *Paris* shewed him a letter, which he had received from one of his own order at *Marseilles*, who lately arrived from the *Levant* (1), where he had been employed as a missionary. His correspondent acquainted him, that he had a gold medal of *Pescennius*, which the curious at *Marseilles* were desirous to purchase, and had offered him a considerable sum for it; but as he hoped to get more at *Paris*, especially if it was not in the King's cabinet, he desired him to let him know that, as likewise what value Mr. *de Boze* put upon

(1) *Le P. Elizée de St. Benoist.*

upon it. His answer was, that he would certainly give a good price for it, if it was antient; but that he could offer nothing, till he had seen it. The owner therefore brought him the medal, which was fair, well preserved, and free from any thing, which might occasion the least suspicion; so that he valued it considerably higher, than what had before been offered, and immediately purchased it for the King.

Soon after he shewed it to the greatest connoisseurs and most curious persons at *Paris*, who were charmed with the sight of so valuable and unexpected a medal in the Royal cabinet. And many both natives and foreigners being desirous of a draught of it, he ordered it to be engraved; together with a Greek medallion in silver, no less rare in its kind, of the same emperor, which is also in the same cabinet, having been purchased at *London* by Mr. *Vaillant* of Mr. *Falkner* (1), father of Sir *Everard*. A print of both these peices accompanies this paper. See TAB. I. Fig. 3 and 4.

The gold medal, *Fig. 3.* has on one side the head of *Pescennius Niger* crowned with laurel, with this legend, IMP CAES C PESC NIGER IVSTVS AVG. And upon the reverse, the goddess *Concord*, represented by a female figure standing, with a diadem on her head, one of her hands elevated, and a double horn of plenty in the other; and round the figure only the word CONCORDIA. For the letters PP, placed below in the field, on the two sides of the figure, being the usual abbreviation of PATER PATRIAE,
arc

(1) See *Numism. Imp. Rom. praef.* p. 216. ed. 1696.

are to be considered as part of the inscription surrounding the head of *Pescennius*. And it is well known, as Mr. *de Boze* observes, that in many medals of the Roman emperors nothing is more common, than to find on the reverse a continuation of those titles, which could not be contained on the same side with the head. But he thinks it has not been yet sufficiently attended to, that in many medals of the cities in *Lesser Asia*, and especially of those in *Cilicia*, where *Pescennius* was first proclaimed, the title *Pater patriae*, which they expressed by the two Greek letters ΠΠ, for Πάτρις πατρίδος, is scarce ever placed in the circular inscription on either side, but in the field of the reverse. For which reason he is inclined to believe, that this medal was struck at *Tarsus*, the metropolis of *Cilicia*, where that practice was more constant, than in any other place.

It would scarce be worth observing, he says, that in the word CONCORDIA the letter D is inverted after this manner α, since such mistakes are very common both in antient and modern coins; was it not to prevent any imaginary suspicion of its being done by design, as emblematical of a pretended concord between the two emperors *Septimius Severus* and *Pescennius Niger*. But this he shews to be highly improbable on the following accounts. First, that it is wholly inconsistent with the elegance, grandeur, and simplicity of antient monuments; and especially of those appointed by authority, which never admitted of any kind of ridicule. Again, that it is a manifest abuse of the language of medals to imagine, that when they exhibit the name or figure of
any

any deity, as *Concord, Plenty, Peace*, and others, any thing more is signified, than addresses made to them on the account of what is there expressed, and hopes of its being granted to the public. This he illustrates from several instances of imperial medals, which need not be here recited. And he further observes from the historians of those times, that *Pescennius*, at the begining of his reign, might think it no difficult matter to have adjsuted matters with *Severus* upon terms advantageous to himself.

The silver medallion mentioned above, *Fig. 4.* has likewise the head of *Pescennius*, crowned with laurel; and a Greek inscription round it thus abbreviated, ΑΥΤΟΚ ΚΑΙΣΑΡ Γ ΝΕΚΚΕ ΝΙΓΡΟΥ Δ. that is, *Imperatori Caesari Caio Pescennio Nigro Jusso.* On the reverse is an eagle standing on a club, with the legend ΠΡΟΝΟΙΑ ΘΕΩΝ, *Providentia Deorum*; which is found also upon the medals of his predecessor *Pertinax*, with whom he is compared by historians both for his civil and military virtues. And Mr. *de Boze* apprehends, that as the eagle and club are the usual symbols of Greek medals struck at *Tyre*, this might probably have been coined there, either in the year 193, the first of his reign, or at the begining of the following year; that is, before the two defeats, which he received, first near *Cyzicus* in the *Hellepont*, and after that between *Nicaea* and *Cius* cities of *Bithynia*. For then the cities, which *Severus* had artfully indeavoured to draw over to his interest, declared for him; more from a jealousy of their neighbours, as *Herodian* observes, than from any dislike to *Pescennius* (1). This revolt was
 begun

(1) *Lib. III. cap. 2.*

begun at *Nicomedia* in hatred of *Nicaea*, which was very zealous for *Pescennius*, and greatly favoured by him. *Tyre* and *Laodicea* followed the example of *Nicomedia*, from an aversion to *Antioch* and *Berytus*. And in like manner *Perinthus*, in opposition to *Byzantium*. In order to put a stop to this threatening mischief, *Pescennius* ordered some of those cities to be plundered and burnt, particularly *Tyre* and *Laodicea*. But among all the cities, which espoused his interest, *Byzantium* behaved with the greatest gallantry; and even after his death held out a siege of three years against all the power of *Severus*, till at length being reduced by famine it was taken, and the walls demolished. Mr. *de Boze* has given a succinct account of this tragical scene from *Dion Cassius* (1). But as it was not his design to write a narrative of all the occurrences relating to those wars, which may be found in the historians, who have professedly treated of them (2); he employs the remainder of his discourse upon some particular circumstances, which respect *Pescennius*, and have not been yet so thoroughly considered, as they deserve.

And he remarks here, that the accounts of historians relating to the descent of *Pescennius* are doubtful and uncertain; some telling us, that he sprang from a patrician and consular family, which had been employed in the highest offices of state, and dwelt long at *Rome* in great splendor: but others, that his birth was obscure, both his father and grand-
father

(1) *Lib. LXXIV. p. 844.*

(2) *Herodian, Dion, Spartian, Mr. Tillemont Tom. III.*

father being no more than agents, or overseers, at the small town *Aquinum* in *Naples*; and that properly speaking he was a soldier of fortune, who raised himself gradually to command the forces in *Syria*, and gained some precarious honours, and a limited consulship, by the interest of the freedmen of *Commodus*, but principally of *Narcissus* the gladiator. But there are several antient *Inscriptions* yet preserved, besides other monuments, which may afford some light in this affair. *Gruter* has seven in his *Collection*, with the name of *Pescennius*; and there are some others in *Reinesius*, *John Baptist Doni*, and *Anthony Muratori*; and a Greek one in the *Miscellanea* of *Spon*, with Γ Π Ε Σ Κ Ε Ν Ν Ι Ο Σ Ο Ν Η Σ Ι Μ Ο Σ. But the great variety in the *cognomen* of these persons render it wholly improbable, that all of them should have been of the same family with the emperor *Pescennius*; since there is no family, even in the most flourishing times of the republic, which appears to have contained so many branches distinguished by a different *cognomen*. And therefore he supposes most of them to have been freedmen or clients, who usually assumed the family name of their patrons, of which he produces many instances; besides others of foreign princes, who paid the like compliment to the Roman emperors.

But *Philip à Turre* has published the fragments of two *Inscriptions* (1), containing the rites and ceremonies of the *Fratres Aruales*, who were a college of priests of great esteem and dignity at *Rome*.

Now

(1) *Fragment. inscript. Fratr. Arual.*

Now among the members of this college mention is made of one *Pescennius Niger*. And as those *Inscriptions* are dated in the fourth consulship of *Commodus* and second of *Aufidius Victorinus*, which answers to the year 183 of our common *aera*; *Muratori*, who has since republished them, says in a note, that this is the same *Pescennius*, who ten years afterwards was advanced to the empire. But here, as Mr. *de Boze* very accurately remarks, he has not observed the difference of the *praenomen*, which in all the remaining medals of this emperor is *Caius*, but in both the inscriptions *Publius*; nor taken care, as he might have done, to support his opinion, notwithstanding that difference in the *praenomen*. For *Commodus*, who has usually the *praenomen* of *Marcus*, has sometimes that of *Lucius*; and *Geta* either *Lucius* or *Publius* indifferently; as *Aemilian* has *Caius* and *Marcus*. These are the only instances, which have occurred to him; but he thought it proper to mention them, that if any new medal of *Pescennius* should be found with *Publius* as the *praenomen*, it might not be rejected merely on that account.

For a further illustration of his family he refers to some passages in *Spartian*, who relates, that in the gardens of *Commodus* at Rome the figure of *Pescennius* in mosaic work was placed among those of the most intimate friends of that emperor, as performing a sacrifice to *Isis* (1). The same writer likewise says, that six persons of the name of *Pescennius* were

(1) *Fragment. inscript. Fabr. Aroal. p. 76.*

were put to death by *Severus*, all of them men of eminence and dignity (1). And he further adds, that his house at *Rome* was remaining in his time, and went by the name of *Pescenniana*; on the pediment of which was placed his statue, which had been sent him as a present *a rege Thebaeorum*, as he expresses it (2). But what the real character of the person was, called here *rex Thebaeorum*, has not hitherto, as Mr. *de Baze* remarks, been rightly settled; with this inquiry therefore he concludes his discourse.

Casaubon, and after him *Salmasius*, *Reinccius*, and Sir *John Marsham*, suppose there was then a governor of that part of *Aegypt*, subject to the *Romans*, to whom they gave the title of *Rex*. But as this notion is no ways countenanced by history, he thinks it cannot well be admitted; and then proceeds to offer his own opinion with equal learning and address. *Augustus*, after the defeat of *Antony* and *Cleopatra*, having reduced *Aegypt* into the form of a province, divided the government of it among several persons of the equestrian order; not thinking it safe to intrust a nation so unsteady, daring, and always given to change, in the hands of senators, who were otherwise too powerful. This division of *Aegypt*, as *Arrian* observes, was made by the *Romans* in imitation of *Alexander* (3). And the governors, as *Strabo* says, appointed by the emperor, tho persons of moderate rank, had τὴν τοῦ βασιλέως

(1) *Fragment. inscript. Fratr. Arval.* p. 69.

(2) *Ibid.* p. 78.

(3) *Arrian. De exped. Alex.* L. III. c. 5.

Βασιλῆως τάξιν, *the authority of a king* (1); or, as *Tacitus* expresses it, were *loco regis* (2). And agreeably to this *Spartian*, speaking of the emperor *Severus*, tells us, that notwithstanding he granted to the *Alexandrians* a civil jurisdiction for their private concerns; yet in all other things he subjected them to the absolute government of a person sent by the emperor, *ut sub regibus ante vivebant* (3). From these reflexions Mr. *de Boze* thinks it may naturally enough be imagined, that this *king of Thebes* mentioned by *Spartian* was no other than a Roman knight, who commanded at *Thebes* with the authority of a king; and might be so called there, in common with the governors of other parts of *Aegypt*; and even at *Rome* too in their ordinary discourse. Which may seem the more probable, if it be considered, how free the Romans made with that name, and to how many things they applied it; as *rex sacrorum*, *conviviorum*, and others. He further observes, that the custom of giving the title of *king* to one of their own magistrates obtained also at *Athens*, and some other cities of *Greece*; and then concludes his discourse with a favourable character of *Pescennius Niger*, taken from ancient accounts.

G. C. May 28.
1750.

J. Ward.

(1) *Lib. xviii. pag. 797.*

(2) *Hist. Lib. i. cap. 1.*

(3) *In vit. Sever. p. 70.*

IX. *A Letter from Robert More Esq; to the President, containing several curious Remarks in his Travels through Italy.*

S I R,

Read June 14. 1750. **I** FIND myself so agreeably led through *Italy* by your Letter, which I received from Mr. *Watson*, that I cannot help adding to the Trouble I before gave you, this, with my hearty Thanks.

When I got to *Barcelona*, I did not indeed find an Opportunity of going immediately to *Naples*, as you proposed; yet am I not sorry that I was forced through the South of *France*, where are many Places, I thought, well worth seeing.

When I got into *Italy*, it was most convenient for me to hasten to *Rome*; where I spent the Winter; and went early to meet the Spring at *Naples*; from which I began your Route.

You cannot more regret your own not having seen the natural Curiosities of that Place, than I do the Loss thereby to the Public. The Voyage-writers do not seem to me sufficiently to have considered the Force and Effects of Steam, which may be formed by Springs of Water falling upon a vast Surface of the fluid *Lava*, and talk too much of Sulphur, deceived by the Complexion of a Salt that covers the Ground in some Places there. In the *Solfatara* I held a cold Iron in the Vent, and there ran down it a Stream of Water. When I went down into the Crater on the Top of *Vesuvius*, it was full of Smoak.

Smoak. Yet I did not perceive it suffocating, and thought it Steam. The Guides indeed tell the *English*, that a Milorde of their Country was suffocated there: Being asked his name, they think it was my Lord *Plinio*. That which they call Sulphur, when I got it home, ran *per deliquium*.

I owe to you the seeing of *Beneventum*; a Place full of Antiquities. At *Arienzo*, a Village half-way to it, I saw Coppice-woods, from which they make *Manna*. They are of the Tree which our Gardeners call the flowering Ash. The Manna is procured by wounding the Bark at the Season, and catching the Sap in Cups: It begins to run (they used the Scripture-Term *Piovere*, i. e. *to rain*) the Beginning of *August*; and, if the Season proves dry, they gather it 5 or 6 Weeks. The King has a great Revenue from it; yet the Tree grows as well in *England*.

At *Terni* I was obliged to your Directions for seeing the Cascade below, as well as above. I went down by the Side of the Precipice; which I believe few have done; or they would not imagine the Fall so little as *Misson* make it, very short of what the People of the Place call it. — Mr. *Addison*, on the contrary, makes the Aqueduct at *Spoletto* as many Yards, as I take it to be Palms. One finds indeed strange Incorrectness in all the 'Travel-writers (tho' you very justly recommended the best) when one reads them upon the Spot. — One of them conjectures the fine Bridge in Ruins at *Narni* might have been an Aqueduct, which manifestly rose all the Way towards the Town, to ease the steep Ascent to it. But I was most surprised to see Mr. *Addison* mis-

quote

quote a *Latin* Verse of *Bembo's*, under a Statue of *Bacchus*, which I think he calls *Apollo's*.

I believe the *Museum* of the *Specula* at *Bologna* is improved since you were there; the joint Collections of Count *Marfigli*, *Marchese Cospi*, *Aldrovandus*, and others, form the finest Set of natural Curiosities I ever saw; and are now improving by the Munificence of the present Pope.

I had certainly missed seeing the continual Fires upon the *Apennines*, by the Badness of the Weather, if it had not been for your Caution. I indeed saw that at *Fiorenzuola* only at a Distance; but I spent good Part of a Night over a more considerable one, as they told me, at *Pietra Mala*, a Village among the Snows. The Fire I imagine to be of the same sort with that about a little Well at *Brosely** in *Shropshire*; of which I think the *Society* has had an Account; the same as of the foul Air sent them from Sir *James Lowther's*† Coal-pits; and the like made by a Gentleman with Filings of Iron and Oil of Vitriol. The Flame here, when I saw it, was extremely bright, cover'd a Surface of about 3 Yards by 2, and rose about 4 Feet high. After great Rains and Snows, they said, the whole bare Patch, of about 9 Yards Diameter, flames. The Gravel, out of which it rises, at a very little Depth, is quite cold. There are three of these Fires in that Neighbourhood; and there was one they call extinct. I went to the Place to light it up again, and left it flaming.

The

* See *Philos. Transf.* N^o. 482, p. 371.
N^o. 442, p. 282.

† N^o. 482, p. 109.

The Middle of the last Place is a little hollowed, and had in it a Puddle of Water : There were strong Ebullitions of Air through the Water. But that Air would not take Fire ; yet what rose through the Wet wet and cold Gravel flamed brightly. Near either of these Flames, removing the Surface of the Gravel, that below would take Fire from lighted Matches.

Sir, I beg Leave to repeat my Thanks for your kind Assistance in this Tour, and to profess myself

Your most obliged, and

Leghorn, June 5. N. S.
1750.

obedient Servant,

Robert More.

X. Extract of Letter from Mr. William Arderon F. R. S. to Mr. Henry Baker F. R. S. containing an Account of a Dwarf ; together with a Comparison of his Dimensions with those of a Child under four Years old ; by David Erskine Baker.

Norwich, May 12, 1750.

Read June 14. 1750. “ **J**OHNS Coam, a Dwarf, was born at
“ *Twitshall* in *Norfolk*, in the Year
“ 1728, and has been shewn in this City for some
“ Weeks past. I weigh’d him myself *Apr. 3, 1750*, and
“ his Weight, with all his Cloaths, was no more than
“ 34 Pounds. I likewise carefully measured him, and
“ found

“ found his Height, with his Hat, Shoes, and Wig
 “ on, to be 38 Inches His Limbs are no bigger
 “ than a Child of 3 or 4 Years old: His Body is per-
 “ fectly strait: The Lineaments of his Face answer-
 “ able to his Age; and his Brow has some Wrinkles
 “ in it, when he looks attentively at any thing.
 “ He has a good Complexion, is of a sprightly Tem-
 “ per, discourses readily and pertinently considering
 “ his Education, and reads and writes *English* well.
 “ His Speech is a little hollow, tho’ not disagreeable;
 “ he can sing tolerably, and amuses the Company
 “ that come to see him, with mimicking a Cock’s
 “ Crowing, which he imitates very exactly. In
 “ 1744 he was 36 Inches high, and weigh’d 27
 “ Pounds and an half. His Father says, when about
 “ a Year old he was as large as Children of that Age
 “ usually are, but grew very little and slowly after-
 “ wards.”

On receiving the Account of this little Man, a
 Child of 3 Years and not quite nine Months old,
 Son of the late very worthy *William Jones Esq;*
F. R. S. was measured and weighed. This Boy,
 tho’ very lively and handsome, is no way remarka-
 ble for his Size; and therefore his Dimensions and
 Weight, compared with the Dwarf’s, may give a tol-
 erable Idea of the real Smallness of the Dwarf.

The Weight of the Dwarf, with all his Cloaths
 on, was no more than 34 Pounds.

The Child’s Weight, with its Cloaths likewise on,
 was 36 Pounds (a).

The

(a) The Cloaths, being weigh’d afterwards by themselves, were
 two

	Inches.
The Height of the Dwarf, with his Shoes, Hat and Wig on - - -	38 $\frac{5}{10}$
The Height of the Child, without any thing on his Head - - -	37 $\frac{7}{10}$

	Dwarf. Inches	Child. Inches
Round the Waist - - -	21	20 $\frac{5}{10}$
Round the Neck - - -	9	9 $\frac{7}{10}$
Round the Calf of the Leg - - -	8	9
Round the Ankle - - -	6	6
Round the Wrist - - -	4	4 $\frac{3}{10}$
Round the Thumb - - -	2	2 $\frac{1}{10}$
Length of the Arm, <i>viz.</i> from the Shoulder to the Wrist - - -	15	13
From the Elbow to the End of the middle Finger - - -	10 $\frac{4}{10}$	10
From the Wrist to the End of the middle Finger - - -	4	4
From the Knee to the Bottom of the Heel - - -	10 $\frac{4}{10}$	10 $\frac{7}{10}$
Length of the Foot with the Shoe on	6	6 $\frac{4}{10}$
Length of the Face - - -	6	6 $\frac{2}{10}$
Breadth of the Face - - -	5	4 $\frac{8}{10}$
Length of the Nose - - -	1 $\frac{2}{10}$	1 $\frac{2}{10}$
Width of the Mouth - - -	1 $\frac{8}{10}$	1 $\frac{8}{10}$
Breadth of the Hand - - -	2 $\frac{5}{10}$	2 $\frac{5}{10}$
		It

two Pounds fourteen Ounces ; consequently the real Weight of the Child is thirty-three Pounds two Ounces ; which is but fourteen Ounces less than the Dwarf's Weight with all his Cloaths.

It may not be improper here to take notice, that as the Measures of the Dwarf were said to be taken with his Cloaths on, these of the Child were also taken over his Cloaths; and they (being a tight Stray and Petticoat) probably sit closer to his Body, and therefore make less Difference in the measuring round his Waist (the only Dimension wherein it could have any Effect) than the looser Coat or Waistcoat of the Dwarf.

*XI. Part of a Letter from Robert More Esq;
to Mr. W. Watson F. R. S. concerning the
Method of gathering Manna near Naples.*

Read June
21. 1750.

AT *Arienzo*, a Town between *Naples* and *Benevento*, I found an Ash-Coppice, of 8 or 10 Years Growth, from which they collect *Manna*. It seemed to have been tapped two Years for that Purpose; the Branches had been barked each Year about an Inch broad, and two Feet high; but they told me this was done by an Inch at a time.

They place a Cup at the Bottom of the Wound, which they empty every five Days. This Liquor becomes *Manna*. They formerly let it dry upon the Tree; but the present way keeps it cleaner. The *Manna* begins to run (they say in the Scripture Style to *rain*) the Beginning of *August*; and if the Season proves dry, they gather it 5 or 6 Weeks. The King of *Naples* has so large a Revenue from it, that he is extremely jealous of it, during the Season
guards

guards the Woods by *Sbirri*, who even fire upon People that come into them, and he makes the stealing of the Liquor Death. The Season in which I was at *Arienzo* prevented my seeing the Species of Ash. I believe it to be what our Gardeners call the flowering Ash; the Complexion of the Bark and Bud agrees with one of them I have in my Garden at *Lindley*. The Man who shew'd me the Wood, told me, it bore a pretty Flower in the Spring. — At *Pisa* in the Physic-Garden they shew'd me that Tree in Bloom as the Manna-Ash. The Tree is indeed common enough in that Neighbourhood: I wonder Mr. *Ray* does not mention it among the Plants found there by him. The *Italians* call it *Orno*. A Botanist at *Rome* told me it was the *Ornus Officinarum*. A Physician at *Benevento* to the same Purpose, that it was the *Ornus* used in Medicine. A Person is gone from *Rome* to *Naples*, who has promised to be very particular in getting you Information of their Manner of curing it. He was bred a Chemist, and told me many Ways of counterfeiting the several Appearances of it. The most common is with *Glauber's* Salts and Sugar, with a small Mixture of Manna. The Price of Manna at *Naples*, they told me, was 4 *Carlins* ($4\frac{1}{2}$ d. Sterling each) the *Rotolo* (32 Ounces).

XII. *A Letter from John Huxham M. D.
F. R. S. to C. Mortimer M. D. Sec. R. S.
containing Observations on the Northern
Lights, seen Feb. 15 and 16, 1749-50.*

Dear Sir,

Read June 21, 1750. **Y**OU have herewith an Account of two uncommon *Phænomena*, which I observed last *February*.

Feb. 15, 1749-50, in the Evening there was a very vivid Northern Light, which darted forth several beautiful, crimson, and fiery-colour'd Rays; Wind NW by N 1, Barometer 30.2; 50 Minutes past 8 a surprisngly bright and exceedingly white Arch, about the Breadth of a common Rainbow, appear'd in the Heavens, extending nearly from East to West; it reach'd within 5 or 6 Degrees of the Western Horizon, and ended about 8 or 10 above the Eastern. It pass'd exactly between *Castor* and *Pollux*, and directly over *Aldebaran*, which appeared plainly thro' it. Near the Top of the Arch several very lucid, white, short, vibrating Columns were attached to it; none of them seem'd above 6 or 7 Degrees long, and did not appear to communicate in the least with the *Aurora borealis*. The inclosed Figure (*see TAB. I. Fig. 5.*) somewhat represents it. About 9h 12' the Arch vanish'd; but several white, bright, corruscating *Nubeculæ* remain'd here and there in the Zodiac for 12 or 15 Minutes longer. The *Aurora borealis* continued more or less till Midnight: The next Morning the Wind was E. 1^r, Barom. 30.1.

Feb.

Feb. 16, about 7 *p. m.* we had another *Aurora borealis*, tho' not quite so fiery and luminous as that of the Night before: It continued till near 11. At 8^h 56' *p. m.* exactly, such another Arch appear'd, very nearly of the same Extent and Direction, but not altogether so broad or lucid. This at first also pass'd between the two bright Stars of *Gemini*, but declin'd more and more to the Southward, till it was 2 or 3 Degrees to the South of *Pollux*. Its Western Limb, about 9, pass'd through the North Shoulder of *Orion*: It quite disappear'd about 10 or 12 Minutes after. — This had no Columns attach'd to it, as the former; tho' it was somewhat jagged and unequal towards the North near the *Vertex*. The Wind this Evening was E. 2; the Barometer 29.9. The next Morning the Wind was SWbW 1, the Barometer 29.9. Neither any Part of the Arch, or the attached Rays were coloured, but perfectly white, and exceeding bright.

I am, dear Sir, with the greatest Respect,

Plymouth, April 18,
1750.

Your affectionate, and
most obedient humble Servant,

J. Huxham.

XIII. *A Letter from John Starr M. D. to John Huxham M. D. F. R. S. containing an Account of an Horſe bit by a mad Dog.*

Dear Sir,

Liskard, Jun. 10 1749

*Recd June 21,
1750.*

BENEATH you have the Account you requested: If it contains any thing worthy your Peruſal, I ſhall be pleaſed. Nothing deſerving Notice is, I think, omitted: Every Circumſtance is truly, and it may be too particularly related.

Dec. 1, 1745. a Neighbour's large Maſtiff Dog, mad, broke out in the Night from the Place where he was too careleſſly confin'd; and, by a rotten back Window, enter'd my Stable, fell upon my Horſe, and bit him in many Places, as Shoulder, Breſt, and right Noſtril; which was indeed much torn. He bled largely. The Town being early in the Morning alarmed by this mad Dog, and my Horſe being found looſe, his Collar broke to Pieces, wounded in many Places, and much Blood ſcatter'd up and down the Stable, it was too juſtly concluded the Dog had fallen upon him.

According to *Deſault's* Method, and what *Dr. James* ſays, in a Letter I had from him on another Occaſion, will effectually prevent the ill Conſequences of this Bite; I immediately order'd the Wounds to be well rubb'd with a mercurial Ointment, *ex Axung. porc. 3vj. Argent. viv. 3ij. About 3ij.* were at times expended.

Next

Next Morning he was bled two Pounds or more; after which I gave him in Milk * *Lichen ciner. terrest.* 3vj. Pip. mg. 3iij. five Mornings successively; which I repeated at the End of a Fortnight for four Mornings more.

As the *Pulv. Antilyssus* was not in our Shops, and no one in Town knew the *Lichen* but myself, I went with my Servant Sunday Forenoon, the Day of my Horse's Misfortune, to seek it. What I found was, I fear, too young; for it seemed just coming from the Earth, and the Leaves were scarce one third as big as at its full Growth. I got what I hop'd might be sufficient; and, after cleansing, perhaps too hastily dry'd it at the Fire, that it might be ready for Use the next Day.

The Wounds heal'd up soon, without any other Application; and the Horse fed uncommonly hearty after a Day or two (during which the Fright had made him uneasy and fretful) and seemed to improve considerably in every respect. I omitted riding him for 20 Days; but about the 20th rid him two short Journeys only. He travell'd chearful and brisk, and I took care not to heat him (for tho' the Horse was old, I would not willingly have parted with him for 20 Pieces). I saw him every Day, but could in no respect discover any thing amiss.

Dec. 25, two Days before the full Moon, my Servant told me, that in the Morning he trembled much on entering the Horse-Pool, and refused to drink at the watering Trough; but in the Evening drank heartily at another Well. This alarmed me; but considering that Horses frequently refuse to drink there, and that he drank in the Evening, I was some-

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* See the *Transf.* No. 237, p. 49, anno 1597.

what easy ; but order'd my Servant, if he refused next Morning drinking at one, to try him at the other ; and if he refused at both, to let me immediately know it.

Dec. 26. As soon as he enter'd the Horse-Pool, he trembled all over in a most surprising manner, and would by no means attempt to drink. The Servant immediately return'd with him. I order'd him to be led into a small Pool of Rain-Water which stood in my Court. The Trembling return'd ; every Muscle was strangely agitated ; he look'd as if he were melancholy on the Water, smelt to it, but would not touch it. Being put into the Stable, a Bucket of pure clean Water was brought to him ; he eagerly thrust his Mouth into the Water, but, endeavouring to suck it, a Convulsion seiz'd him.

I was now satisfied he had a true *Aque Pavor*. He was bled to about 3 Pints, Musk 3℞. *Cinnab. Ant.* 3j. made into a Ball with *Cons. Anthos* was given him. In bleeding he once snapt at the Smith, tho' well known to him, having shoed him for Years : And indeed this was the only Time he attempted to bite any one.

In about two Hours after the Musk was given to him, I offer'd him with my own Hands about two Gallons of white Water warm : he drank it off without the least Difficulty or Hesitation. Had I dissolved in it two Ounces of Nitre, I had certainly done well.

Had the Quantity of Musk at first given been greater (for Dr. *James* writes, me he gives the above Quantity of the best Musk in a Watchfulness remaining after a febrile *Delirium* is remov'd), or had I now again repeated the same Ball, I am apt to think
think

think the Horse might have been saved (this being the *Tonquin* Method, even after the Appearance of the *Hydrophobia*); for he was as yet quiet and tractable. I went to him as usual, handled him, and he behav'd as in his former Health; but, being look'd on as a mad Horse, I saw every one was afraid to meddle farther with him.

He eat both Hay and Oats heartily. In the Evening, about 9 o' Clock, more of the white Water was offer'd him, but he drank none.

Dec. 27. This Night the Madness increased much; for he had bit the Manger as far as he could reach, and made it quite ragged. In the Morning he frequently bit his Breast where the Wound had been; and when he happen'd to take hold, violently drew up the Skin with his Teeth. Both these things he did during the Day at times, but most in the Morning. I put a Tub of Water before him; he greedily ran his Nose into it; but, endeavouring to drink, a dreadful Convulsion seized him, which sometimes drew his Buttock to the Ground; at others his Back was so hollowed with it, that his Belly was brought almost down on the Litter. During the Convulsion he would groan in an affecting manner; and frequently cry out. As soon as the Convulsion was over, he repeated his Endeavours to drink with the same cruel Event; and would, I believe, had the Water stood before him, have repeated it the whole Day.

He still eat his Allowance of Hay and Oats; but when not eating, he was continually thrusting out his Tongue, and working with his Lips, as if to moisten and cool them. His Tongue was exceedingly dry, and of a blackish-brown Colour on the

Surface. As he eat Oats, I have sometimes lamented I had not mixed *Turpeth. mineral.* with them.

I tried him with Water about 9 at Night; every thing was as in the Morning; only the Convulsion was, if possible, stronger, and more excruciating; for he groaned deeper, louder, and in a more affecting Tone.

His Breath was exceeding hot; it came from his Nostrils like Smoke from a Chimney-Top; he expanded his Nostrils as if he had been violently running; and the Steam was visible for more than a Yard Distance.

Dec. 28. This Night he broke his Collar in Pieces, broke down the Partition by which he was separated from the Place of my other Horse, traversed the Stable, attempted to get out; in order to which he beat down the under Half of the Stable-Door; however, in the Morning, being spoken to by my Servant, he neigh'd, immediately went to his Place, where he stood biting his Breast and Manger almost continually. His Look was now become wild and furious, and about 10 o' Clock I order'd him to be shot. I am,

Dear Sir,

Your affectionate humble Servant,

J. Starr.

P. S. I observed he was always worse, every Symptom being aggravated at the time the Moon came to the Meridian; which again, as the Day advanced, in some degree abated.

XIV. Descriptio Fœtus monstrofi sine ullo
Sexus Signo; *Regali Societati* cõmmuni-
cata per *Job Baster*, Acad. Cæsar. et Reg.
Soc. *Lond.* Soc.

Read June 28
1750.

QUamvis plurimæ sint monstrorum de-
lineationes et descriptioes raro ta-
men occurrunt exempla, in quibus nullæ adsint partes
genitales: cum tamen hic casus mihi obvenit, *Regiæ
Societati* hujus delineationes offero: (TAB. II. *Fig. 1*
and 2.) quem circiter septimestrem sanissima mulier,
tertio partu, tempore gravidationis nulla imaginatione,
metu, aut terrore percussâ, in lucem edidit.

Caput hujus infantis non, uti oportet, erat sphæricæ
figuræ, sed valde acuminatum, brachium dextrum
bene formatum; sinistri vero radius et ulna multo
breviores esse videbantur.

Ne minimum partium genitalium, quibus sexu m
distingueres, erat vestigium, nec anus, aut ejus aper-
tura; verum eo loco cutis, abundante pinguedine,
quasi in gyros erat reducta, et circumvoluta.

Ex medio ventre, genitalium loco, provenit pes
unus in unicum quasi digitum, sine ungue tamen
finiens.

Repetitis precibus apertio cadaveris fuit negata,
externa delineatio concessâ, quam *Regiæ Societati*
debita reverentia offero, una cum delineationibus
fœtus et hydrocephali, quorum historiam ante aliquot
annos (anno 1742) *Regiæ Societati* obtuli, et N^o.
466, p. 277, in *Transactionibus* legi possunt.

XV. *Some Experiments on Substances resisting Putrefaction*; by John Pringle M. D.
F. R. S.

Read June 28, 1750.
here printed with Additions.

THO' an Inquiry into the Manner how Bodies are resolv'd by Putrefaction, with the means of accelerating or preventing that Process, has been reckon'd not only curious, but useful (a), yet we find it little prosecuted in an experimental way: Nor is it to be wonder'd at, considering how offensive such Operations are: Wherefore, as I have been led to make some Experiments and Remarks on this Subject, from the Accident of having had an uncommon Number of putrid Distempers under my Care in the Hospitals of the Army, I shall venture to lay before the *Society* what I have found somewhat different from the common Opinion, as well as some Facts, which, as far as I know, have not been mention'd before.

I. Finding it a received Notion, that Bodies by Putrefaction became highly alkaline, I made the following Experiments, to inquire how far this was true in Fact.

The

(a) Lord Bacon calls, "the inducing or accelerating Putrefaction" a Subject of very universal Inquiry; and says, "that it is of excellent Use to inquire into the means of preventing or staying Putrefaction; which makes a great Part of Physick and Surgery." See *Nat. Hist. Cent. IV.*

The *Serum* of human Blood putrified, made, with a Solution of Sublimate, first a turbid Mixture, and afterwards a Precipitation. This is one of the Tests of an *Alkali*, but scarce to be admitted here; since the same thing was done with recent Urine (of a Person in Health), which is never accounted alkaline. The same *Serum* did not tinge the Syrup of Violets green; and made no Effervescence when the Spirit of Vitriol was poured upon it. I made the Experiment twice upon Portions of different *Serum*, both highly putrid; and once on Water, in which corrupted Flesh had been some time infused; and the most I could find was, that, having given the Syrup previously a small reddish Cast with an Acid, this Colour was rendered fainter, but not destroyed by the putrid Humours; and as to the Effervescence, having dropped the Spirit of Vitriol into these Liquors unmixed, and also diluted with Water, the Mixture was quiet, and only a few Air-bubbles appeared on shaking the Glasses. Upon the whole, tho' there were some Marks of a latent *Alkali* in the putrid *Serum*, they were so very faint, that one Drop of Spirit of Hartshorn in a Quantity of Water equal to that of the putrid Liquors, shewed more of an *Alkali* than twenty Drops of any of the other.

2. It has been a Maxim, that all animal Substances, after Putrefaction, being distill'd, send forth a great Quantity of volatile Salt in the first Water; but Mr. *Boyle* found that this held good only in Urine; and that in the Distillation of the *Serum* of human Blood putrefied, the Liquor which first came over had little Strength, either as to its Smell or
Taste,

Taste, and did not at first effervesce with an Acid. And here it may be observed, that the Chemists have generally applied those Properties they discovered in Urine, to all the Humours indifferently; whereas, in Fact, there is a great Diversity. For some animal Substances, such as Urine and Bile, *soon* putrefy; the *Saliva* and the White of an Egg *slowly*. Yet those that soonest corrupt do not always arrive at the highest Degree of Putrefaction. Thus the Bile is soon corruptible, but the Rankness of it is not to be compared to that of Flesh; and the White of an Egg is not only much less disposed to putrefy than the Yolk, but, when corrupted, yields a different and less offensive Smell. And it seems particular to stale Urine to contain an alkaline Salt, which, without Distillation, makes a strong Effervescence with Acids: Whereas most other animal Humours putrefied, tho' of a more intolerable *Fætor*, yet contain less volatile Salt, less extricable, and not effervescing with Acids. But what makes the Difference between stale Urine and other putrid Substances still more specific, is, its Inoffensiveness with regard to Health; whilst the Steams of most other corrupted Bodies are often the Cause of putrid and malignant Diseases.

Now, upon finding in Urine a much greater Quantity of volatile Salt, and that more easily separable than in any other Humour, and that stale Urine is the least noxious of putrid animal Substances, so far then from dreading the volatile *Alkali* as the deleterious

* Nat. Hist. of Human Blood, Vol. IV. p. 178. fol.

leterious Part of corrupted Bodies, from this Instance we may rather infer it to be a sort of Corrector of Putrefaction.

3. Daily Experience shews how harmless the Volatiles are, both when smelled to, or taken in Substance; but still there remains a Prejudice, as if these Salts, being the Produce of Corruption, should therefore hasten Putrefaction; not only in Distempers where these Salts are unwarily taken, but also in Experiments out of the Body.

Now, as to the Effects arising from the internal Use of them, little can be said, unless the kind of Disease was precisely stated. For, supposing they were by their Nature disposed to promote Putrefaction; yet if that is already begun, from a Languor of Circulation, and Obstruction, then may the Volatiles, by their stimulating and aperient Quality be the means of stopping its Progress: And, on the other hand, tho' they were really antiseptic, yet if the Humours are disposed to corrupt from Excess of Heat or Motion, these very Salts, by adding to the Cause, may augment the Disease. So that, upon the whole, it will be the fairest Criterion of the Nature of these Volatiles to enquire, whether out of the Body they accelerate or retard Putrefaction.

In order to decide this Question, I have made repeated Experiments of joining both the Spirit and Salt of Hartshorn to various animal Substances; and have constantly found, that, so far from promoting Putrefaction, they have evidently hinder'd it; and that with a Power proportioned to their Quantity. The Trials have been made with the *Serum* of the Blood, and also with the *Crassamentum*, after it had

been dried by keeping. I once separated the thick inflammatory Crust of pleuritic Blood from the rest of the Mass; and, dividing it, I put one Portion into distill'd Vinegar, the other into Spirit of Hartshorn; and after keeping the Infusions above a Month in the middle of Summer, I found the Piece which lay in alkaline Spirit as sound as that in the Acid.

Another time I put in one Phial about an Ounce and a half of an equal Mixture of Ox's Gall and Water, with 100 Drops of Spirit of Hartshorn; and in another as much of the Gall and Water without any Spirit. The Phials, being corked, were set by a Fire, so as to receive about the Degree of animal Heat; whereby, in less than two Days, the Mixture without the Spirit became putrid, but the other was not only then, but after two Days longer untainted.

I afterwards infused two Drachms of the Lean of Beef with two Ounces of Water and half a Drachm of Salt of Hartshorn. Another Phial contained as much Flesh and Water with a double Quantity of Sea-Salt: In a third was the Flesh and Water only to serve by way of Index. These Phials were placed on a Lamp-Furnace, in a Heat varying between 94 and 104 Degrees of *Fahrenheit's* Scale. About 18 Hours after Infusion, the Contents of that Phial which served as an Index, were rank; and in a few Hours more that with the Sea-Salt was also putrid; but the Flesh with the volatile Alkali was sound, and continued so after standing 24 Hours longer, in the same Degree of Heat: And that the Smell of the Hart's-horn might occasion no Deception, the Piece of Flesh was washed from the Salt, and still smelled sweet.

About the same time I took three Pieces of fresh Beef, of the same Weight as above; and laying two

of them in Gallypots, I cover'd one with Saw-duft, and the other with Bran : But the third Piece being strew'd with Salt of Hartshorn powder'd I put into a four Ounce Phial which had a glass Stopper. They were all three placed in the Outside of a Window expos'd to the Sun; and the Weather being warm, on the third Day the Flesh in the Gallypots began to smell; on the fourth were putrid. Next Day the Phial was examined; when the Flesh was washed from the Salt, and found quite sweet. It was then dry'd and salted again with Hartshorn; and having stood in the House some Weeks longer in sultry Weather, it was look'd at a second time, and observed to be as sound as before; neither was the Substance at all dissolved, but was of such a Consistence as might be expected from common Brine*. And lest it might be suspected, that the Flesh in the Gallypots, by being more expos'd to the Air than that in the Phial, became sooner putrid, I have since inclos'd Flesh in Phials, as that with the Hartshorn and found the Confinement rather hasten the Putrefaction.

Now, by these and many other Experiments of the kind, finding volatile alkaline Salts not only do not dispose animal Substances to Putrefaction out of the Body, but even prevent it, and that more powerfully than common Sea-Salt, we may presume that the same taken by way of Medicine, will, *cæteris paribus*, prove antiseptic; at least we cannot justly suppose them Corrupters of the Humours more than fermented Spirits or Sea-Salt; which

Qqq 2

taken

* The same Piece has been since kept dry a Twelvemonth, and is still untainted, and as firm as at first.

taken in immoderate Quantities may raise a Fever, and thereby accidentally be the Occasion of Corruption.

4. I have likewise made several Experiments with the fixed alkaline Salts which have no less antiseptic Power than the volatile. The Trials were made both with the Lye of Tartar and Salt of Wormwood. But here we must not confound a disagreeable Smell of such Mixtures with one that is really putrid ; nor the Power those Lixivia's have of dissolving animal Substances with Putrefaction.

5. From these Experiments it was natural to conclude, since Acids by themselves were amongst the most powerful Antiseptics, and the alkaline Salts were likewise of that Class, that the Mixtures of the two to Saturation would resist Putrefaction little less than the Acid alone. But in the Trials I have made upon Flesh with a *Spiritus Mindereri* composed of Vinegar saturated with Salt of Hartshorn, and also with the Juice of Lemons saturated with the Salt of Wormwood, I found the antiseptic Virtue considerably less than when either the Acids or *Alkali's* were used singly.

6. As for the comparative Virtues of these Salts upon Flesh, I found half an Ounce of Lemon-juice saturated with a Scruple of the Salt of Wormwood resisted Putrefaction nearly as much as fifteen Grains of Nitre ; but, when the Trial was made with Ox's Gall, two Drachms of this Mixture were more antiseptic than a Scruple of that Salt. Again, Nitre compar'd with the dry neutral Salts, Weight for Weight, is more antiseptic than any in preserving Flesh I have yet tried. Crude *Sal ammoniac.* came next to it, and even exceeded it in the Experiment with Ox's Gall. After these the *Sal diureticus*, *Tartarus solubilis*,
and

and *Tartarus vitriolatus*, seemed to have nearly the same Power.

I have mixed Vinegar with a large Quantity both of Chalk and Crabs-eyes, in order to neutralize it; but, tho' seemingly saturated by the Effervescence ceasing, it still retain'd an Acidity, and was found much more antiseptic than Lemon-juice neutraliz'd with the Salt of Wormwood; tho' this last Acid be considerably stronger than Vinegar.

7. Thus far have we consider'd the common neutral Salts; which, however powerful in resisting Putrefaction, are inferior to some resinous Substances, and even some Vegetables which I have tried. Thus Myrrh, in a watry *Menstruum* was found at least twelve times more antiseptic than Sea-Salt. Two Grains of Camphire mixed with Water preserved Flesh better than sixty Grains of that Salt: And I imagine, could the Camphire be kept from flying off, or concreted to the Sides of the Phial, that half a Grain, or even less, would have sufficed. An Infusion of a few Grains of *Virginian* Snake-root in Powder exceeded twelve times its Weight of Sea-Salt. Chamomile-Flowers have nearly the same extraordinary Quality. The Jesuit's Bark has it also; and if I have not found it so strong as the two Substances last mention'd, I impute that in part to my not being able to extract its embalming Parts in plain Water.

Now Vegetables possessing this balsamic Quality are the more valuable, in that, being usually free of Acrimony, they may be taken in much greater Quantities than either Spirits, Acids, Resins, or even the neutral Salts. And as in the great Variety of Substances
answering

answering this Purpose, there may be also some offensive or useful Qualities annexed, it may not be amiss perhaps to review some Part of the *Materia medica* for this End.

I shall add, that, besides this extraordinary Power in preserving Bodies, I have discover'd in some of these Substances a sweetening or correcting Quality after Putrefaction had actually begun. But these Experiments I shall lay before the *Society* some other time; with a Table of the comparative Force of Salts, and some further Remarks on the same Subject.

N. B. *These Experiments will be continued in the next Number of these Transactions.*

XVI. *An attempt to explain an antient Greek inscription, ingraven upon a curious bronze cup with two handles, and published with a draught of the cup by Dr. Pococke, in his Description of the East, Vol. II. Part 2. pag. 207. By John Ward, Pr. Rhet. Gresh. and F. R. S.*

Read June 28. 1750. **T**HE diameter of the cup on the inside is about thirteen inches and a half, as near as I could take it from a copy of the inscription, which is placed round the upper side of the rim. A draught of which is hereunto annexed, reduced to about two thirds of the size (1); and

Fig. 1

p 479.

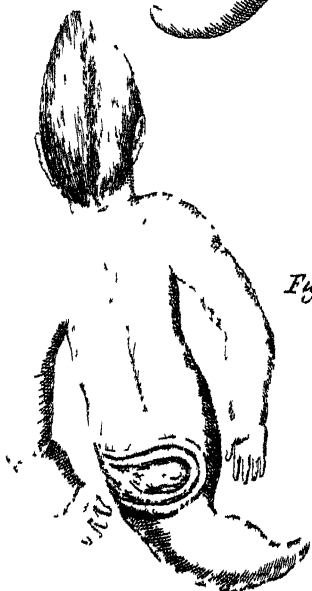
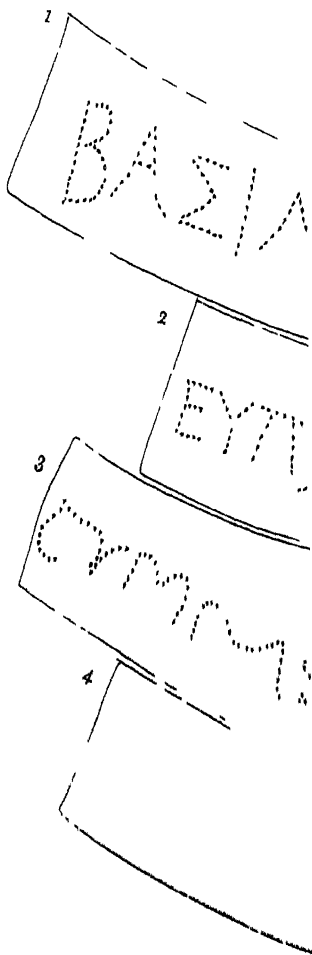


Fig. 2.



POCVLI INSCRIPTIO.

Fig. 3. p. 488.

ΕΥΣ ΜΙΘΡΑΔΑΤΗΣ

ΑΥΡΟΤΡΙΝΟΥ
MNA

ΤΟΙΣ ΤΑΙΣ

ΕΙΟΥΕΥΤΑ

ΣΥΦΑΔΙΑΣΤΕ

and may also be seen in Dr. *Pococke*, with only this difference, that the characters on the cup are not cut in continued lines, as in the doctor's plate, but consist of separate points placed in the form of letters, as here represented. Letters expressed in this manner appear upon several antient coins; and may likewise be seen in the silver plates, found not long since in *Hertfordshire*, and published in these *Transactions* (1). As to the circular form of the inscription, we read in *Pausanias* of an instance not very much unlike this. *Iphitus* king of *Elis* is said to have restored the Olympic games, during which all hostilities ceased among the several states of *Peloponnesus*. Throwing the *discus* or *quoit* was one of the exercises performed in those games, and the *discus* of *Iphitus* was deposited in the temple of *Juno* at *Olympia*; upon which the cessation of arms, always observed at that solemnity, being ingravened was then publicly read. Which inscription, as the historian observes, was not cut in strait lines, but in the form of a circle. Tho whether the letters were placed on the face of the *discus*, or upon the edge, like some modern coins, is not expressly said. The words are these: Ταύτην [ἐκ χειρὶαν] ἔκ ἐς ἐνθὺς ἔχει γεγραμμένην, ἀλλὰ ἐς κύκλῳ σχῆμα περιέεισιν ἐπὶ τῷ δισκῷ τὰ γράμματα. That is: *Hæc* [induciæ] *non recto versuum ordine sunt inscriptæ, sed literis in disco orbem ambientibus* (2).

But

(1) *Num.* 476.

(2) *Pausanias*, *Lib.* v. c. 20. p. 427. *ed.* *Lips.* 1626. Where *Pet. Faber* for ἐς ἐνθὺς reads ἐς ἐνθὺ, *Agonist.* *Lib.* ii. c. 26.

. But I return to the inscription on the cup, which, as I apprehend, may be thus read in the common Greek characters.

M N Δ
 ΒΑΣΙΛΕΥΣ ΜΙΘΡΑΔΑΤΗΣ ΕΥΠΑΤΩΡ
 ΤΟΙΣ ΕΝΤΟΣ ΤΟΥ ΓΥΜΝΑΣΙΟΥ ΕΥΠΑΤΟΡΙΣΤΑΙΖ
 ΓΥΦΑ vel ΓΟΥΦΑ ΔΙΑΞΩΣΕ,

In *Latin* thus :

*Monumentum dedit
 Rex Mithradates Eupator Eupatoridis
 in gymnasio [vel intra gymnasium]
 Gypha [vel Gupha] servavit.*

I. The letters Μ Ν Δ stand by themselves over the rest, which are placed below them in the form of a circle; which circle is made up of the four segments here put one under another, when united in one orbicular line. And the situation of these three letters in the annexed draught shews, over what words of the circular part they are placed. All the words from ΒΑΣΙΛΕΥΣ to ΕΥΠΑΤΟΡΙΣΤΑΙΖ take in above half the circumference of the rim of the cup; and the division of this last word was occasioned, as I suppose, by one of the handles being fixed there. The two last words stand at a considerable distance from the rest, on the remaining part of the rim.

II. If those three letters above the rest are not a date, they may, as I conjecture, stand for *μνημόσυρον δῶκε* for *ἔδωκε*, without the augment. Where the word *μνημόσυρον* seems to be used in the same sense, as we meet with it in *Catullus*, when he says, *Verum est μνημόσυρον mei sodalis* (1).

III.

III. In the circular line *Μιθραδάτης* is put for *Μιθριδάτης*, as his name is usually written. And so it is spelt in two other inscriptions, both found by *Spon* in the isle of *Delos*, at a considerable distance from each other, and published in his *Voyage d'Italie etc* (1). The like spelling may also be seen both on the coins of this prince (2), and in the edition of *Tacitus* published by *Lipsius*. These inscriptions were cut on the remaining pedestals of two statues, which had formerly been placed there, one in honour of *Mithridates Euergetes* the father of this prince, and the other of himself. I shall here transcribe them both, as they will serve to illustrate that on the cup. The former runs thus :

ΒΑΣΙΛΕΩΣ ΜΙΘΡΑΔΑΤΟΥ
ΕΥΕΡΓΕΤΟΥ ΣΕΛΕΥΚΟΣ
ΜΑΡΑΘΟΝΙΟΣ ΓΥΜΝΑΣΙΑΡΧΩΝ.

In Latin :

*Regis Mithradatis Euergetae Seleucus
Marathonius gymnasio praefectus
statuam posuit.*

The latter is as follows :

ΒΑΣΙΛΕΩΣ ΜΙΘΡΑΔΑΤΟΥ ΕΥ
ΠΑΤΟΡΟΣ ΕΥΤΥΧ.....ΤΟΥ
ΜΙΘΡΑΔΑΤΟΥ ΕΥΕΡΓΕΤΟΥ
ΔΙΟΝΤΣΙΟΣ ΝΕΣ.....ΝΟΣ
ΑΘΗΝΑΙΟΣ ΓΥΜΝΑΣΙΑΡΧΗ
ΣΑΣ ΑΝΕΘΗΚΕΝ.

In Latin :

Regis

(1) *Tom. III. pag. 86.*

(2) *Numism. Pembroch. Par. II. tab. 66.*

Regis Mithradatis Eupatoris Eutycho. filii Mithradatis Evergetae Dionysius Neseus Atheniensis gymnasium praefectus posuit statuam.

It appears highly probable by these inscriptions, that there was a *gymnasium* (1), or college, at that time in *Delos*. And the same writer observes, that near to the former he found eleven pillars standing without chapiters, and others lying on the ground. At which place, as he says, the inhabitants of the neighbouring isles (for *Delos* was then uninhabited) have a tradition, that a college antiently stood; and he further adds, that the corsairs still continue to call this island by the name of *The schools* (2). And therefore it is not improbable, that this cup, which some years since was found in the port of *Antium*, and (as Dr. *Pococke* says) is now placed among the antiquities of the capitol at Rome, might formerly have been brought from that island: and the name *Eupatoridae* given to those of the college, in honour of this king *Mithridates*, their benefactor; who seems to have been pleased with the name *Eupator*, ascribed to him in the latter inscription, since he built a city in *Paphlagonia*, which he called *Eupatoria*, as we are told by *Pliny* (3) and *Appian* (4). By the latter of whom we learn also, that he was
fond

(1) By the word *gymnasium* among the Greeks was meant a number of contiguous buildings, with portico's and open walks, so disposed as to be fitted, some for bodily exercises, and others for the study of the liberal arts and sciences.

(2) *Tom. I. pag. 177.*

(3) *Nat. Hist. Lib. vi. cap. 2.*

(4) *Rom. Hist. pag. 251, ed. Steph.*

fond of fine ornaments, and elegant furniture; and had made a vast collection of them, of which vases were always esteemed a considerable part (1). The imperfect word ΕΥΤΥΧ. which follows *Eupatoris* in the same inscription, may perhaps stand for ΕΥΤΥΧΟΤΣ, *Eutycheis*, or *Felicis*; as that word occurs at length in another inscription discovered by *Spon* in the same island, of which the two names ΔΙΟΝΥΣΙΟΥ ΕΥΤΥΧΟΥ then only remained (2). Tho indeed I have not met with that name elsewhere ascribed to *Mithridates*; notwithstanding *Cicero* mentions a large catalogue of extravagant titles, which had been heaped upon him by his flatterers. *Mithridatem*, sais he, *Deum, illum Patrem, illum Conservatorem Asiae, illum Euum, Nysum, Bacchum, Liberum nominabant* (3). But yet it is possible, that the title *Eutyches* might have been given him, on account of his great success in war for many years. As *Sylla* afterwards assumed that of *Felix*, for the like reason; and upon his triumph at *Rome*, for his victory over that powerful prince, had also his other titles of *Conservator* and *Pater* ascribed to him, as we are told by *Plutarch* (4). These inscriptions give us also the names of two presidents of that college, the former of whom is called *Seleucus* of *Marathon*; and the latter *Dionysius* of *Athens*, who might possibly have taken the

(1) *Rom. Hist.* pag. 251. ed. Steph.

(2) *Tom. III.* pag. 87.

(3) *Pro Flacc.* c. 25.

(4) *Vit. Syll. Tom. v.* p. 865. ed. Steph. See likewise *Plut. Annal. ad A. U.* 672.

the name *Dionysius* from his patron *Mithridates*, who besides the name *Eupator* assumed also that of *Dionysus* as the same author relates (1). But the second name of this latter president *Nes...nus* being imperfect, I am at a loss how to fill it up.

IV. The letters next following 'Ευπαλῶρ upon the cup I take to stand for τοῖς ἐνὶ τοῖς; tho they are strangely confused, by reason of a mistake, which seems to have been made at first in writing the inscription. In the word γυμνασίῃς the two letters να are united in one character. And as to the expression ἐνὶ τοῖς γυμνασίῃς, which here refers to place, and not to time, as it more usually does; *Hesychius* has, ἐν τοῖς τῷ σώματι; *Phavorinus*, ἐν τοῖς οἰκίαις; and *Apollonius Rhodius*, as cited by *H. Steph.* ἐν τοῖς ἄγχεος. And in the word 'Ευπαλοῖσταιζ, the letters στ are put for δ, and ζ for σ.

V. Of the two last words upon the cup, which (as has been observed) stand separate from the rest, the former is a proper name; but whether the first character in it was designed only for a Γ, or a combination of the two letters ΓΟ, I am not certain. In the following word διαξωζε without the augment, for δέσωσε, ξ is put for σ; and likewise ζ, as in the preceding word 'Ευπαλοῖσταιζ. I should have been led to imagine, that *Gypha*, or *Gupha*, might be the name of the sculptor, and διαξωζε stand for δέξωσε, *exsculpsit* or *persculpsit*; it being a common practice for artists to set their own names to their works; had it not appeared an objection to this, that

(1) *Ibid.* pag. 250 See also *Plut. Sympos. L. I. q. 6.*

that the inscription is no better executed; and likewise that neither the form, nor combination, of the letters seems to suit with the age of *Mithridates*. I am therefore inclined to think, that the cup did not come into the hands of this person till a considerable time afterwards; who seems to have been no great scribe, but was willing however to preserve both the memory of so curious a vase, and his own as the possessor of it.

As the several variations from the common manner of spelling, which occur in this inscription, are to be met with in *Greek* writers; I shall trouble this Assembly with no further remarks upon them, than just to observe, that *Lucian* in his humorous discourse, intitled *Judicium vocalium*, complains, that among many other innovations, which had then crept into the language, τ had invaded the place of δ , and both ξ and ζ that of σ .

Thus I have attempted to offer my thoughts upon this intricate inscription, and explain it in such a manner, as appeared to me the most probable, from a copy of it, communicated to me some years since by *Smart Lithieullier* esquire, a worthy member of this Society, who had it from Father *Revillas* at *Rome*.

G. C. Sept. 15.
1749.

John Ward.

Postscript.

Spon was at *Delos* in the month of *August* 1675, when he copied the two inscriptions mentioned above. But it seems to be owing to the smallness of his page, that the former of them is printed in four lines;

for *Wheeler*, who took it at the same time, brings it into three, in the following manner:

ΒΑΣΙΛΕΟΣ (¹) ΜΙΘΡΑΔΑΤΟΥ
ΕΤΕΡΕΤΟΥ ΣΕΛΕΥΚΟΣ
ΜΑΡΑΘΟΝΙΟΣ ΓΥΜΝΑΣΙΑΡΧΩΝ (²).

Tournefort, who was there in *October* 1700, confirms this draught of *Wheeler*, as to the form of it; and says, the inscription was cut upon a square pedestal, two feet five inches high, and two feet one inch broad. And as part of it was defaced at the beginning of the lines, I have here transcribed the copy published by him, of what then remained.

... ΜΙΘΡΑΔΑΤΟΥ
... ΣΕΛΕΥΚΟΣ
... ΓΥΜΝΑΣΙΑΡΧΩΝ (³)

But Dr. *Anthony Askew*, a worthy member of this Society, who was there in *October* 1747, tho he found the pedestal pretty much broken, in the manner described by *Tournefort*; yet observed more letters of the inscription then remaining, than are given us by him. The difference will appear by the following copy, with which the Doctor was pleased to oblige me out of his large and curious collection of inscriptions, and other valuable antiquities:

..... Σ ΜΙΘΡΑΔΑΤΟΥ
..... ΟΥ ΣΕΛΕΥΚΟΣ
..... Σ ΓΥΜΝΑΣΙΑΡΧΩΝ.

The

(1) The O in this word seems to be a mistake in the print for Ω

(2) *Travels*, pag. 56.

(3) *Voyage du Levant*, Tom. I. pag. 297. a Paris 1717. qu.

The latter inscription mentioned above, as erected in honour of *Mithridates Eupator*, was found, as *Spon* informs us, upon a round basis, at a great distance from the other. It is likewise taken notice of by *Wheeler*, tho he has given no draught of it. But *Tournefort* supposes it to have been gon, before he was there; because, upon searching for it, he could not find it. Which indeed is not to be wondered at; since we are told by *Spon*, that *Delos* being intirely in ruins, and without any inhabitants, the ancient remains, being of *Parian* marble, are frequently carried away by strangers, either for curiosity or use.

However *Tournefort* discovered part of another pedestal, in the shape of a cylinder, not far from the former of the two already mention'd. It lay half buried in the sand, but being opened and washed, an imperfect inscription was found upon it. The remaining words of which are these:

ΒΑΣΙΛΕΩΣ ΝΙΚΟΜΗΔΑ..
 ΤΟΥ ΕΥΤΟΝΟΥ (1) ΒΑΣΙΛΕΩΣ
 ΝΙΚΟΜΕΔΟΥ (2) ΕΠΙΦΑΝΟΥ
 ...ΚΟΥΤΡΙΔΗΣ (3) ΔΙΟΣΚΟΡΙΔΟΥ
 ΠΑΜΝΟΥΣΙΟΥΣ ΓΥΜΝΑΣΙΑΡΧΟΥ..

In Latin thus :

Regis

(1) I am obliged likewise to Dr. *Askew* for a copy of this inscription, taken by himself; by which it appears, that T in this word is a mistake for P, as the Doctor has written it.

(2) The E in this word is also a mistake for H, as it is written in the first line here, and by Dr. *Askew* in both places.

(3) I take this to be the same name as the following; the middle syllable of which is usually written with O, but sometimes with OΥ. See *Grut. pag. LXXXVI. num. 2.*

*Regis Nicomedis nepotis regis Nicomedis Epiphanis
Dioscorides Dioscoridis Ramnusius praefectus
gymnasio statuam posuit.*

King *Nicomedes*, to whose honour this inscription was erected, is here called ἑγγονός, that is *grandson*, of *Nicomedes Epiphanes* king of *Bithynia*. Which seems to confirm the account of *Appian*, who gives the name *Nicomedes* to the three last *Bithynian* kings. The first of whom being, as he says, the son of *Prusias* (and here stiled *Epiphanes*) was succeeded first by his son *Nicomedes Philopator*, and then by his grandson, whom he calls barely *Nicomedes*, without subjoining any *cognomen*, agreeably to this inscription. And he further adds, that it was this last, who left his kingdom to the Roman people by his will (1). Which bequest was made in the year of the city 679, and was soon followed by their third and last war with *Mithridates Eupator* (2). Some have supposed this account of *Appian* to be erroneous, through a mistake in the copies; because other writers generally mention but one *Bithynian* king, as successor to *Nicomedes Epiphanes*, who was also named *Nicomedes*, made the Roman state his heir, and has been taken for his son (3). But the inscription, by calling this latter the *grandson* of the former, as *Appian* does, corroborates his account; who likewise says expressly, that his son *Philopator* was

(1) *Rom. Hist.* pag. 175, ed. Steph.

(2) *Pigh. Annal. Rom.*

(3) See *Vaillant, Achemenes. imper. Tom. II. pag. 345, 354.*

was confirmed in his father's kingdom by a decree of the Roman senate (1).

I thought it proper to take notice of this inscription, not only as it seems to clear up the succession of the *Bithynian* kings; but likewise as it contains the name of a third president of the college in *Delos*, and shews the regard that was paid to it by the princes of different countries in *Asia*.

J. W.

XVII. *A Letter from Mr. Henry Baker F. R. S. to the President, containing Abstracts of several Observations of Auroræ Boreales lately seen.*

S I R,

Read June 28,
1750.

ON Monday the 23d of January last, some unusual Appearances were observed in the Sky, at *London*, and the Towns about it,

(1) *Vaillant* has given us the impression of an head upon a silver tetradrachm, with this title placed over it, *Nicomedes Epiphanes rex Nicomediae*; whom he takes to have been the grandfather of *Prusias*: *Achemenes. imp. Tom. II. p. 304.* And *Dr. Mead* has such a coin in his collection, with these words on the reverse, ΒΑΣΙΛΕΩΣ ΕΠΙΦΑΝΟΥΣ ΝΙΚΟΜΗΔΟΥΣ. Where *Epiphanis* the cognomen stands first, as it sometimes does in ancient writers: *Cic. Orat. c. 27.* An impression also of a similar coin, with the head on one side, and the same legend on the other, may be seen among the *Numismata Pembroke. Par. II. tab. 69.* But *Vaillant* says, that he had not met with any coin, which had on it the head of *Nicomedes Epiphanes* the son of *Prusias*, to whom the inscription refers, which is cut on the stone. *Ubi supra, pag. 355.*

it, by Thousands of People during the whole Evening, of which some Accounts were laid before the *Royal Society*: And as Appearances of the like kind were observed in the Heavens, the same Evening, at great Distances from *London*, I take the Liberty to present you a Description of what was seen at the City of *Norwich*, by Mr. *William Arderon* F. R. S.; and also of what was observed at *Wells* (a little Sea-Port Town in the same County of *Norfolk*, about 30 Miles nearly due North from *Norwich*) by Mr. *Joseph Sparshal*, and sent by him to Mr. *Arderon*, who communicated it to me.

An Account of the Aurora Borealis seen at Norwich, Jan. 23, 1750. by Mr. William Arderon.

THE wonderful Appearances of the *Aurora Borealis* on the 23d of *January* last, have been taken notice of in most Parts of *England*, tho' in different Forms. At *Norwich* I believe it was as extraordinary as at any Place whatever: But the Weather being very cold, and myself somewhat indisposed, I did not make all the Remarks I could have wished: The few I did make are as follow:

This wonderful *Aurora* began at 6 o' Clock in the Evening, with a blackish Cloud in the N. E. out of which sprung up a Streak of scarlet-colour'd Rays, of a surprising Beauty and Vividness. This presently extended to within a few Degrees of the S. W. Horizon, passing directly thro' the *Zenith*, and so continuing near a Quarter of an Hour, when red and yellow Columns began to rise upwards from every Quarter.

At

At 7 o' Clock a black Cloud rose up in the S.E. and quickly put on a semicircular Form, with light yellowish Vapours ascending out of its upper Edge, and representing a Glory of an uncommon Brightness.

At 8 o' Clock the black Cloud was dispersed, but the yellow Glory remained; and round that sprang up another Circle of Red, which made the whole appear very tremendous.

The reddish Streams, as well as this last-mention'd Circle, were sometimes so dense, that even Stars of the first Magnitude could not be seen thro' them.

There was now-and-then some of the flashing *Aurora* in different Parts of the Firmament, tho' not so common as I have observed at other times.

The Night was full as light as it is when the Moon is about eight Days old; but I could compare it neither to the Light of the Sun nor Moon, some of the original Colours seeming to be wanting: And the best Description I can give of it is, to liken it to that Light produced in a dark Room, when one of the seven original Colours is separated from the rest, after they have passed thro' a Prism, and been collected together again by a convex Lens.

This Evening the Barometer was 30.1 falling. *Haukesby's* Thermometer 63. Wind E. $\frac{1}{2}$ Force. The Morning misty, and very cold, but all the Day clear.

Part of a Letter from Mr. Joseph Sparshal, of Wells, concerning those Lights in the Heavens, seen Jan. 23, 1749-50. to Mr. William Arden at Norwich.

ON *Tuesday Jan. 23*, the Air at *Wells* was clear and serene during the greatest Part of the Day, with a fresh Breeze of Wind at S. S. E. which terminated in an Evening extremely remarkable for Appearances in the Heavens of an uncommon *Aurora Borealis*.

At 15 Minutes past 5, I first took notice of the Foot of an Arch, which formed an Angle of about ten Degrees with the N. E. Part of the Horizon. This Arch shot out pointed Streams like Pyramids, of a fiery red Colour, which generally ascended within a few Degrees of the *Zenith*, then vanished, and were immediately succeeded by others, from the N. E. where the principal Magazine seemed to be. They continually shifted towards the E. and S. W. with sudden Flashings and Dartings; but towards the West the Appearances seldom altered.

At 30 Minutes past 5, a luminous Stream, of a bright Flame-Colour, shot up on the N. Side of the fiery Arch, which still kept somewhat of that Form, tho' frequently interrupted by shooting Flashes from the N. E.

At 40 Minutes past 5, there appeared suddenly in the N. E. an elliptical *Corona*, of an amazing Brightness, elevated about 9 Degrees above the Horizon, and having its longest Diameter parallel thereto. There shot up perpendicularly from this Streams resembling

sembling Columns of Flame intermixed with others of bright Red.

At 50 Minutes past 5, Part of the Hemisphere, included between the N. E. and S. E. was strongly illuminated, with a vast Number of pointed Rays of Crimson and Flame-colour, darting towards the *Zenith*. These vanishing in about four Minutes, were succeeded by many whitish Streaks, shutting from the N. to the S. E.

At 55 Minutes past 5, there sprang up in the N. three bright Pyramids of Flame-Colour, ascending to the Height of about 70° , not perpendicular to the Horizon, but inclining towards the E. and these were joined at the upper Parts by an equal Number of a blood red Colour from the S. E.

At 6, a Pyramid of a crimson Colour rose from the N. E. to the Height of about 60° . This soon disappeared; but a diffused Redness remained; and from the N. E. to the S. W. appeared an Arch, crowned at the *Vertex* with something resembling a Glory, with a round Body of Light in its Centre.

At 20 Minutes past 6, the Redness was contracted into a narrower Compass, but was much deeper in Colour, forming an Arch from S. E. to S. W. and appeared at the *Zenith* like a fiery Sheet spread towards the South; the North being at the same time illuminated with white Streams, like the common *Aurora Borealis*.

At 30 Minutes past 6, a whitish semicircular Arch was formed to the Southward, encompassing the red Lights in the *Zenith*, and extending from the E. to the S. W. But this Appearance continued only a few Moments.

At

At 40 Minutes past 6 the Redness quite disappeared in the N. E. and that to the Southward became much paler. The common *Aurora* appeared very plain in the N. E. till 7 o'Clock, and then totally disappeared.

At 8 the common *Aurora* appeared again very bright from N. to E.

At 30 Minutes past 8 appeared another large semicircular Arch, extending from E. to W. pointed Columns of a bright Red shooting up from each Side of its Base; with other smaller ones on the upper Part of it, such as the common *Aurora*. At the same time arose in the North, from within a very few Degrees of the Horizon, a bright pyramidal Stream of Light, of a surprising Magnitude. This Appearance continued near a Quarter of an Hour very regular, and exceeding beautiful.

At the Beginning of these Lights the Mercury stood at 29.9, but quickly fell to 29.8. The Wind at S. E. $\frac{7}{16}$ Force.

During Part of the Time I observed an uncommon Motion in the magnetic Needle; but was too closely engaged in observing the Heavens to take much notice of it.

I saw this Evening those Meteors called falling Stars; particularly some, which, on taking Fire, left a long Train of Sparks behind them.

My Situation being quite open to the Sea on all Sides, except the South, afforded me as favourable an Opportunity of viewing the above Particulars as I could wish; and I gave up my whole Attention to them.

Having

Having laid these Accounts before you, permit me the Honour to be,

S I R,

Catharine Street, June 13.
1750.

Your most obedient -

humble Servant,

H. Baker.

XVIII. *A Description of a Mariner's Compass contrived by Gowin Knight, M. B. F. R. S.*

Read July 5. 1750. **T**HE Discovery of the Mariners Compass has probably been of more general and important Use to human Society, than the Invention of any one Instrument whatsoever: And yet so far have they been from studying the Improvement of it, that there would be no Absurdity in supposing that the first which was made might be as much superior to those in common Use now, as the most improved Instrument we have is superior to its first Contrivance.

The Compass which appeared before this *Society* last Year, on account of its being render'd useless by Lightning *, was what afforded me the first Idea of their Imperfections, some of which I then enumerated; but others have since occurred to me, arising from the Structure of the Needle, which I had not sufficiently considered at that time. It was then observed, that almost all the Compasses on board our Merchant-

* See these *Transactions*, N^o. 492, p. 111.

Merchant-Ships had their Needles formed of two Pieces of steel Wire; each of which was bent in the middle, so as to make an obtuse Angle; and their Ends, being applied together, make an acute one; so that the Whole represents the Form of a Lozenge; in the Centre of which, and of the Card, is placed the brass Cap. I procured twenty Cards, with Needles of this kind fixed to them; and after touching them with a Pair of large Bars, I tried each of them, with the same Cup and Pin, by drawing them aside 90 Degrees from the true Point, and then seeing where they would rest. I found them all to vary more or less, either to the East or West; and some of them as far as 8 Degrees. Few of them came to the same Degree twice together; and when they did, that was never the true Point. In short, they not only varied from the true Direction, but from one another, and from themselves. I then tried, by drawing them gently aside, how far I could make them stand from the true Point, without returning; and found they might frequently be made to do it at the Distance of a whole Point on either Side. One of them, which generally varied 6 or 7 Degrees to the East, being drawn the same Way, would stand at 16 Degrees. *

All these Irregularities are owing to the Structure of the Needle: For the Wires, of which it is composed, are only hardened at the Ends; and that is done by making the Ends red hot, and quenching them in Water: If all these Ends are not equally hard, or if one End be hardened higher up than the other, when they come to be put together, in fixing them to the Card, that End which is hardest, will destroy much

much of the Virtue of the other ; by which means the hardest End will have most Power in directing the Card, and must consequently make it vary towards its own Direction. If you retouch these Wires when fixed to the Card, the Error will still remain ; for that Wire which is best hardened will always become the strongest. Considering how uncertain this Method of hardening the Ends of the Wires must be, it is a great Chance if they should once in an hundred times be equally and uniformly hard : And unless they are, the Card to which they are fixed must necessarily vary.

The Wires being disposed in the Form of a Lozenge, is the Reason why these Cards had so little Force, that they might be made to stand at the Distance of several Degrees, on either Side the Point from whence they were drawn. For all magnetical Bodies receive an additional Strength, by being placed in the Direction of the Earth's Magnetism, and act proportionably less vigorously when turned out of it. Wherefore, when these kind of Needles are drawn aside from their true Point, two of the parallel Sides of the Lozenge will conspire more directly than before with the Earth's Magnetism ; and the other two will be less in that Direction : By which means the two first Sides will very much impede its Return ; and the two latter will have that Impediment to overcome, as well as the Friction, by their own Force alone.

The Needles that are used on board the Men of War, and some of the larger trading Ships, are made of one Piece of Steel, of a Spring Temper, and are broad towards the Ends, but tapering to-

wards the Middle, where a Hole is made to receive the Cap. At the Ends they terminate in an Angle greater or less, according to the Skill or Fancy of the Workman. Now, tho' the worst of these are infinitely preferable to those of Wire, yet the best of them are far from being perfect. Every Needle of this Form has 6 Poles instead of two. There is one at each End, two where it becomes tapering, and two at the Hole in the Middle. This is owing to their Shape; for the middle Part being very slender, it has not Substance enough to conduct the magnetic Stream quite through from one End to the other. All these Poles appear very distinctly, when examined with a Glass that is sprinkled over with magnetic Sand. Nevertheless this Circumstance does not hinder the Needle from pointing true; but as it has less Force to move the Card, than when the magnetic Stream moves in large Curves from one End to the other, it is certainly an Imperfection.

I examined an hard Needle of this sort, whose Ends were very broad, and terminated in an acute Angle; and observed, that, tho' its Motion was very free and vigorous, yet I could make it stand one Degree on either Side the true Point; and being at a Loss to account for it, I tried what Appearance it would make under a Glass with magnetic Sand, and discover'd that the magnetic Stream came out of the Sides, which formed the acute Angle at the Ends, in Lines that were almost perpendicular to those Sides, and then was bent round to go to the other Pole: From whence I concluded, that when the Needle was drawn a little from the true Point, the Stream, which came out of one of these Sides, would

would be more in the Direction of the Earth's Magnetism than before; on which account it would act stronger in retaining the Needle in that Situation, than the Stream of the other Side in restoring it; especially as that Stream would be now weaker, on account of its being turned out of the magnetical Line, and would have the Friction betwixt the Cap and Pin to overcome at the same time.

I tried two other Needles, whose Ends were formed into Angles very obtruse, and could not find that they were liable to the same Objection.

Two Needles, that were quite strait, and square at the Ends, were found to have only two Poles; but about the Hole in the Middle the Curves were a little confused. These always came exactly to the same Point, after vibrating a long time; and if drawn never so little on one Side, would return to it again without any sensible Difference. We may therefore conclude, that a regular Parallelopiped is the best Shape for a Needle, as well as the simplest; with the Holes for the Caps as small as can well be contrived; or if it can be made to answer the Purpose without any Hole at all, it will be still more perfect.

Yet the common Shape has one Advantage which this has not: For, being made broad at the Ends, and slender in the Middle, its Weight is removed as far as possible from the Centre: On which account, if it once points true, the Friction at the Centre cannot so easily put it in Motion; and its Vibrations, when in Motion, will be slower; so that their Limits may be more nicely observed, and the middle Point betwixt them is that where it would



stand, if at rest. Being unwilling to part with these Advantages, I contrived a light Circle of Brass, of the same Diameter with the Card, which will supply a Weight acting at the greatest Distance from the Centre of Motion, and also serve to support the Card; which may now be made of thin Paper, without any thing to stiffen it. So that the extraordinary Weight of the brass Ring is compensated in a great measure by the Lightness of the Card. This Ring is of Service in another respect; for, being fixed below the Card, and the Needle above it, the Centre of Gravity is placed low enough to admit of the Cap being put under the Needle; whereby the Hole in the Needle becomes unnecessary; and the latter being placed above the Card, renders it easier to be touched with a Pair of Bars.

Having thus completed the Needle and Card to my Satisfaction, what chiefly remains, is, to contrive such a Cap and Point as will have the least Friction, and be most likely to continue in a State of Perfection. The Caps in Use are either of Brass, a mixed Metal, like that of a reflecting Telescope, Crystal, or Agate. The two first will only admit of brass Points, and the latter are rather too expensive for common Use. Wherefore I bethought myself of trying glass Caps: I had three of them made by a Glass-blower, two of which I got polished: They were all set in Brass, so as to screw into the same Needle, which had also one of Agate fitted to it. I compared them with that of Agate, by trying with each of them how many Vibrations the same Card and Needle would make, when drawn aside 90 Degrees,

Degrees, on the same Point; which was a very small sewing Needle.

The Number of Vibrations with the Agate Cap, on the first Trial, were 39, then 37, then 39 again; with one of the glass Caps it made 23, and then 20. This Difference from the Agate Cap was so great, that I concluded the Point must be damaged, and therefore chose a finer; on which the same glass Cap made 41 Vibrations; then 43; and another glass Cap made 47, and the next time 43. But the Agate Cap with this Point made 51, 57, and 58 Vibrations. The unpolished glass Cap performed much the same with the others. I had two of them polished again by Mr. *Smeaton*; and in Company with him repeated the same Experiments; but with no better Success. The Agate Cap made always many more Vibrations than the glass one; and generally with the latter the Number diminished by repeated Trials; whereas with the Agate Cap it usually increased.

These Experiments made me lay aside the Thoughts of glass Caps, and put me upon thinking how Agate ones might be made with as little Expence as possible.

With this View I got a Cap turned of Ivory, in such a manner as to receive a small Bit of Agate at the Top. This being ground concave, and polished on that Side, where it formed the *Apex* of the hollow Cone in the Cap, was capable of answering the Purpose as well as if the Whole had been Agate, and was much lighter. These Caps may be made cheap enough for common Use; and, if good at first, cannot easily be impaired.

For a Point, I chose a common sewing Needle, and contrived to fix it in such a manner as to be taken out with the greatest Ease, and replaced by another, if necessary; by which means an excellent Point may be always had with little Trouble or Expence. Common Needles, when well temper'd, have all the Qualifications that can be desired for the Purpose intended. The smallest are strong enough to bear the Weight of a Card; and are neither so soft as to be liable to bend, nor so hard and brittle as to break; and they are generally better pointed than any that a common Workman could pretend to make *extempore*.

Thus we have gone through all the Parts that are essential to a Mariner's Compass; and endeavoured to put them upon such a Footing, as to leave as little Room as possible for Error in their first Construction, or Failure in the long continued Use of them.

This, which I have now the Honour to exhibit to the *Society*, was made by Mr. *Smeaton*, a Gentleman whose uncommon Skill in the Theory and Practice of Mechanics has enabled him to execute whatever I proposed in such a manner as always to exceed my Expectations: And not only so, but he has added a considerable Improvement of his own. By a very simple Contrivance he has made the same Instrument capable of serving the Purposes of an Azimuth and Amplitude Compass; and that in a manner much preferable to any thing hitherto contrived; the Description and Use of which he has drawn up himself, for the Perusal of the *Society*.

XIX. *An Account of some Improvements of the Mariners Compass, in order to render the Card and Needle, proposed by Doctor Knight, of general Use, by John Smeaton, Philosophical Instrument-maker.*

*Presented July 5, 1750
her, printed with alterations.*

THE Cover of the wooden Box being taken off, the Compass is in a Condition to be made use of in the Bittacle, when the Weather is moderate: But if the Sea runs high, as the inner Box is hung very free upon its Centres (the better to answer its other Purposes) it will be necessary to slacken the mill'd Nut, placed upon one of the Axes that supports the Ring, and to tighten the Nut on the Outside that corresponds to it. By this means the inner Box and Ring will be lifted up from the Edges, upon which they rest, when free; and the Friction will be increased, and that to any Degree necessary to prevent the too great Vibrations; which otherwise would be occasioned by the Motion of the Ship.

To make the Compass useful in taking the magnetic Azimuth, or Amplitude of the Sun and Stars, as also the Bearings of Head-lands, Ships, and other Objects at a Distance, the brats Edge, designed at first to support the Card, and throw the Weight thereof as near the Circumference as possible, is itself divided into Degrees and Halves; which may be easily estimated into smaller Parts, if necessary.

The

The Divisions are determined by means of a Cat-gut Line stretched perpendicularly with the Box as near the brass Edge as may be, that the Parallax arising from a different Position of the Observer may be as little as possible.

Underneath the Card are two small Weights, sliding on two Wires, placed at right Angles to each other; which, being moved nearer to, or farther from the Center, counterbalance the Dipping of the Card in different Latitudes, or restores the *Equilibrium* of it, where it happens by any other means to be got too much out of Level.

There is also added an *Index* at the Top of the inner Box, which may be put on and taken off at pleasure, and serves for all Altitudes of the Object. It consists of a Bar, equal in Length to the Diameter of the inner Box; each End being furnished with a perpendicular Stile, with a Slit parallel to the Sides thereof. One of the Slits is narrow, to which the Eye is applied, and the other is wider, with a small Catgut stretch'd up the Middle of it, and from thence continued horizontally from the Top of one Stile to the Top of the other: There is also a Line drawn along the upper Surface of the Bar. These four, *viz.* the narrow Slit, the horizontal Catgut Thread, the perpendicular one, and the Line on the Bar, are in the same Plane, which disposes itself perpendicular to the Horizon, when the inner Box is at rest, and hangs free. This *Index* does not move round, but is always placed on so as to answer the same Side of the Box.

When the Sun's Azimuth is desired, and his Rays are strong enough to cast a Shadow, turn about the wooden Box, till the Shadow of the
horizontal

horizontal Thread ; or (if the Sun be too low) till that of the perpendicular Thread in one Stile, or the Light through the Slit in the other, falls upon the Line on the *Index* Bar, or vibrates to an equal Distance on each Side of it, gently touching the Box, if it vibrate too far : Observe at the same time the Degree marked upon the brass Edge by the catgut Line. In counting the Degree for the Azimuth, or any other Angle that is reckon'd from the Meridian, make use of the outward Circle of Figures upon the brass Edge, and the Situation of the *Index* Bar, with regard to the Card and Needle, will always direct upon what Quarter of the Compass the Object is placed.

But if the Sun does not shine out sufficiently strong, place the Eye behind the narrow Slit in one of the Stiles, and turn the wooden Box about, till some Part of the horizontal or perpendicular Thread appears to intersect the Centre of the Sun, or vibrate to an equal Distance on each Side of it, using smoked Glass next the Eye, if the Sun's Light is too strong. In this Method another Observer will be generally necessary to note the Degree cut by the *Nonius*, at the same time the first gives notice that the Thread appears to split the Object.

From what has been said, the other Observations will be easily performed ; only in case of the Sun's Amplitude, take care to number the Degree by the Help of the inner Circle of Figures on the Card, which are the Complements of the outer to 90, and consequently shew the Distance from East or West.

The Azimuth of the Stars may also be observed by Night; a proper Light serving equally for one Observer to see the Thread, and the other the Degree upon the Card.

It may not be amiss to remark farther, that, in case the inner Box should lose its *Equilibrium*, and consequently the *Index* be out of the Plane of a vertical Circle, an accurate Observation may still be made, provided the Sun's Shadow is distinct: For, by observing first with one End of the *Index* towards the Sun, and then the other, a Mean of the two Observations will be the Truth.

Explanation of the Figures.

Fig. 1. is a perspective View of the Compass, when in Order for Observation. The Point of View being the Centre of the Card, and the Distance of the Eye two Feet.

AB, is the wooden Box.

C and *D* are two mill'd Nuts; by means whereof the *Axes* of the inner Box and Ring are taken from their Edges, on which they move, and the Friction increased, when necessary.

EF is the Ring that supports the inner Box.

GH is the inner Box; and

I is one of its *Axes*, by which it is suspended on the Ring *EF*.

KL is the Magnet or Needle; and

M a small Brace of Ivory, that confines the Cap to its Place. See *Fig. 2.*

The Card is a single varnished Paper, reaching as far as the outer Circle of Figures, which is a Circle
of

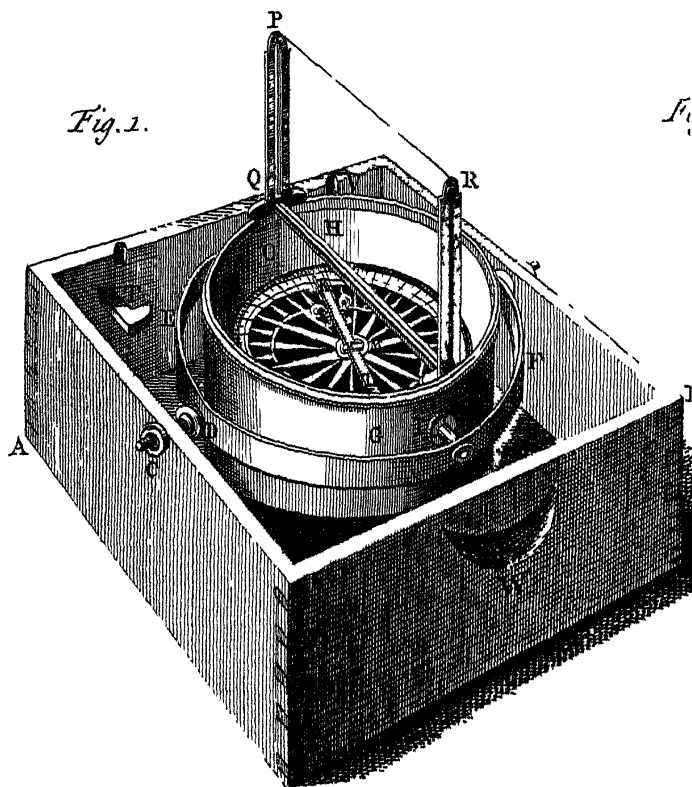


Fig 3.

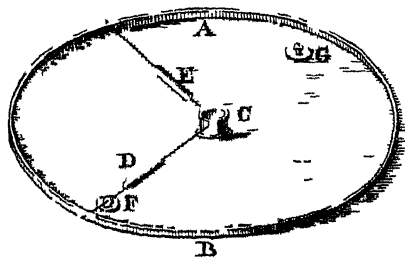


Fig. 4.

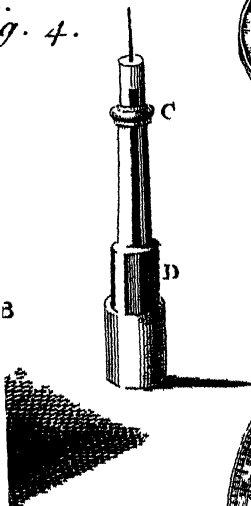
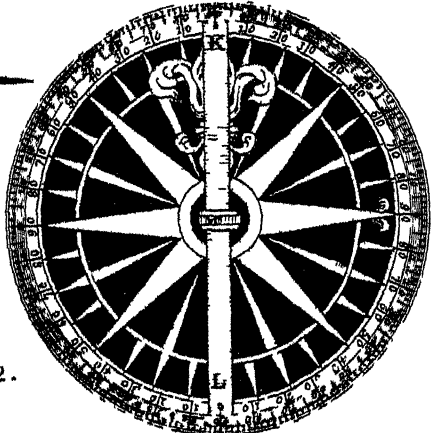


Fig. 2.



of thin Brass, the Edge whereof is turned down at right Angles to the Plane of the Card to make it more stiff.

O is a catgut Line drawn down the Inside of the Box ; for determining the Degree upon the brass Edge.

PQRS is the *Index* Bar, with its two Stiles and Cat gut Threads; which being taken off from the Top of the Box, is placed in two Pieces, *T* and *V*, notched properly to receive it.

W is a Place cut out in the Wood, serving as an Handle.

Fig. 2. is the Card *in plano* with the Needle fixed upon it; being one Third of the Diameter of the real Card.

Fig. 3. is a perspective View of the Backside of the Card, where

AB represents the turning down of the brass Edge.

C is the under Part of the Ivory Cap.

D and *E* are the two sliding Weights to balance the Card; and

F and *G*, two Screws that fix the brass Edge, &c. to the Needle.

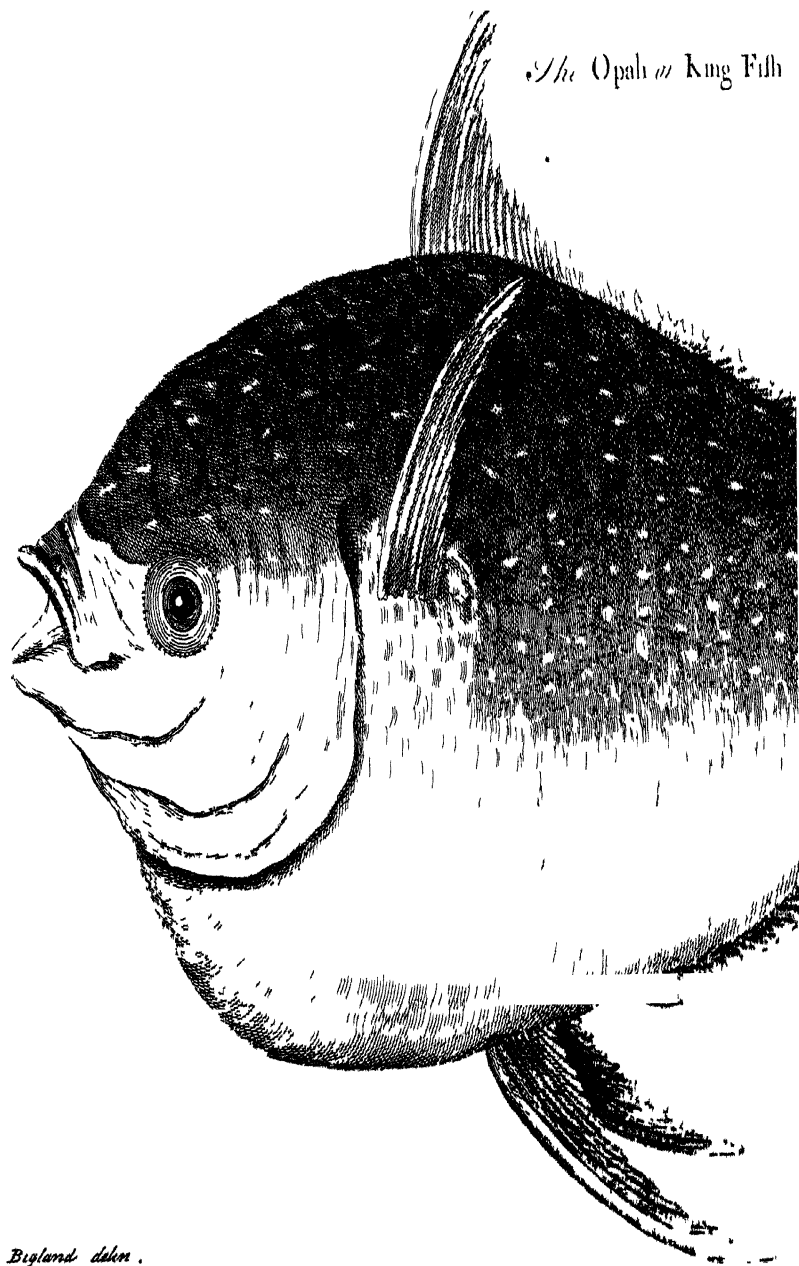
Fig. 4. is the Pedestal that supports the Card, contained a sowing Needle, fixing in two small Grooves to receive it, by means of the Collet *C*, in the manner of a Port Ceyon. At *D* the Stem is filed into an Octagon, that it may be the more easily uncrew'd.

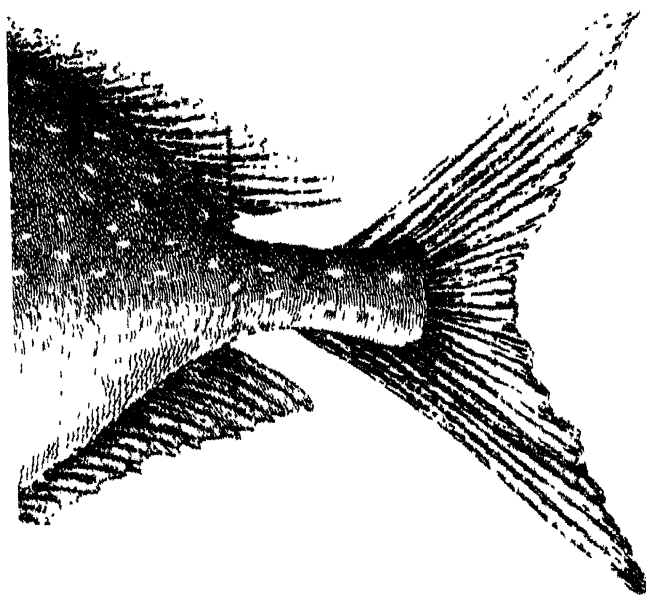
XX. *The Description of a Fish, shewed to the Royal Society by Mr. Ralph Bigland, on March 22, 1749-50: Drawn up by C. Mortimer, M. D. Secret. R. S.*

Read July 5, 1750. **T**HIS Fish is smooth-skinn'd, has no Scales, nor Teeth: It has one erect Fin on its Back, which arises below its Neck, and runs within a little of its Tail. On each Side about the Middle, between its Back and Belly, behind the Gills is a Fin: From the Bottom and Middle of its Belly, a little forward of the Ventr, arise a Pair of Fins: From behind the Vent runs one Fin, within a little of the Tail: The Tail-Fin is large and forked. Its Eyes are large; the *Irides* are scarlet, encompassed with a Circle of a gold Colour verged with scarlet. Its Nostrils are placed above its Eyes. The Back, and upper Part of the Body quite to the Tail, was of a dark blue, or violet Colour; these, and the Sides of the Body, which were of a bright green, were all speckled with oblong white Spots; the Chaps were of a pale red; the Nose, Gills, and Belly, were of a silver Colour; and all the Fins of a bright scarlet.

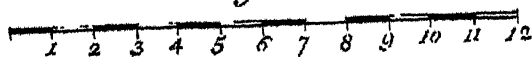
It was 3 Feet 7 Inches long, and 3 Feet 10 Inches round in the thickest Part. It weighed 82 Pounds. Its Mouth is small; its Tongue was thick, almost like a human Tongue in Shape, but rough, and thick-set with Beards or Prickles, which pointed backwards; so that any thing might easily pass down, but could not easily slip back again; therefore these might serve instead of Teeth for retaining its Prey or Food. Its Gills resemble those of a Salmon. Its Body grows
very

The Opah or King Fish





A Scale of Inches.



J. Mynde sc.

very taper towards the Tail; and, from being compressed to 10 Inches Thickness, becomes near the Tail almost round, and about 3 Inches thick. The whole Shape of this Fish much resembles the Sea bream; but it differs in Size, being much larger, and in not having Teeth nor Scales. The Fin standing erect on the Back, has some *Aculei* next the Neck, and rises up 8 Inches; but in the Middle diminishes to 1 Inch; and near the Tail rises again to about 3 Inches. The Belly-Fin opposite to this spreads 3 Inches near the Tail, and diminishes towards the Vent. The Tail-Fin is forked, and spreads 12 Inches. The Gill-Fins are 9 Inches long, and 3 wide at their Basis. The 2 Belly-Fins were 11 Inches long, and 3 wide at their Basis. It seems to me to be a new Species of Fish, not yet described by any Author.

The black Prince, and his Cousin, from *Anamaboe* on the Coast of *Guinea*, and Mr. *Creighton*, formerly Governor of *Capo Corso Castle*, upon seeing this Fish immediately knew it, and said it was common on that Coast, and is very good to eat. The Natives call it *Opah*, and the *English* there call it the *King fish*. I shall therefore retain the *Guinea* Name, with these Characteristics; *OPAH Guiniensum est piscis offeus, non squamosus, edentulus; habens unicam in dorso pinnam anteritis aculeatam, pone branchias par pinnarum, in medio ventre par pinnarum, ad posticam ventris partem unicam pinnam, caudam forcipatam.*

Mr. *Bigland* says, that, upon opening of it, all its Bowels would have gone into a Quart-Mug; that the Flesh of the fore Part was firm, and look'd like Beef, and the hinder Part like fine Veal; that the Bones were like those of Quadrupeds; particularly
the

the Shoulder-blades, which resembled those of Sheep. [See an Article in the *Scots Magazine* for October 1748. printed at *Edinburgh* in 8vo.] In a Letter to me, he adds, that probably this was a [Pelagian or] Ocean Fish, waſtiring by chance into the Frith of *Forth*; and, by the Tide ebbing, being left upon a conſiderable Shoal, or flat Sand, near *Leith*, was diſcover'd from Land in a State of Diſtreſs; where-upon ſome Fiſhermen plunged into the Sea, and with a Net ſurrounded it, and brought it to Shore.

XXI. *A Letter from John Burton M. D. to C. Mortimer M. D. & Secr. R. S. concerning the Extirpation of an Excreſcence from the Womb.*

S I R,

Read July 5. 1750. I HAVE at laſt got a Drawing of an Excreſcence * growing from the Inſide of the *Os Tineæ* on the right Side; which I herewith ſend you, (ſee TAB. I. Fig. 6.) along with as full and perfect an Account of the Caſe as I can.

The Wife of one *Chapman*, a Whiteſmith, at *Selby*, ten Miles off, upwards of ſeven Years ago lay in of her laſt Child, and had a tolerable eaſy Labour: Soon after which, ſhe had what ſhe called the *Fluor albus*, that continued ever ſince, and increaſed upon her; inſomuch that ſhe ſays, ſhe has ſometimes

* It is exactly the Dimensions of the Original, which weighed 5 Ounce, and a half. That Part below the prick'd Line appeared out of the *Vagina*; that above reach'd from the *Labia* to the *Os Uteri*.

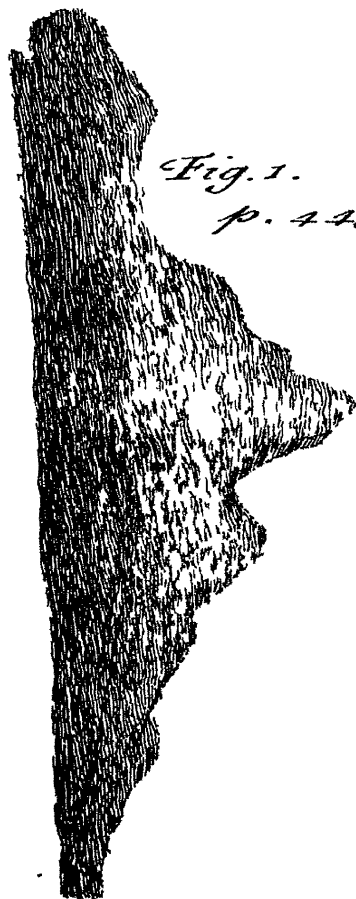
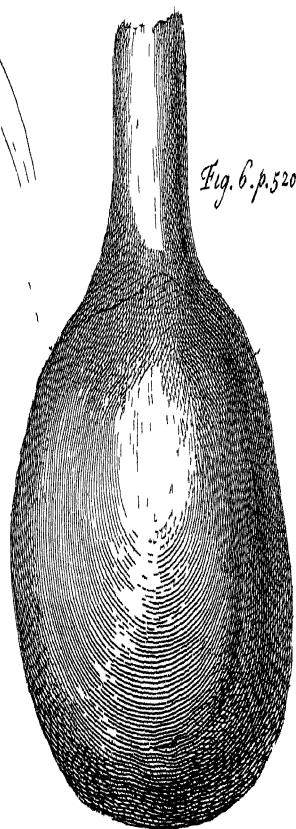
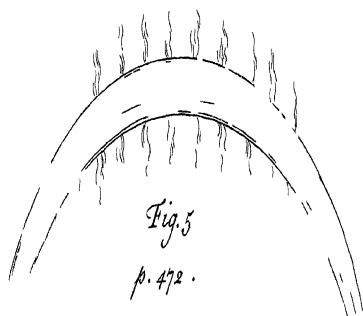
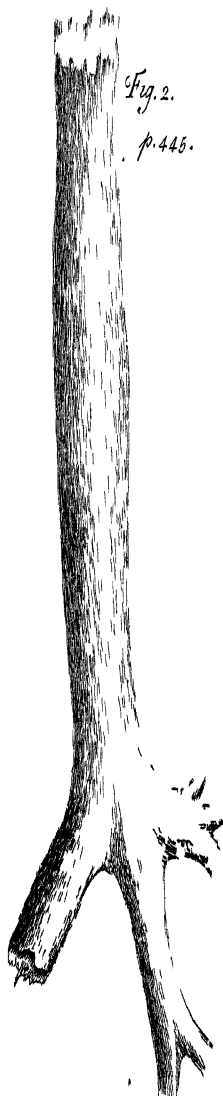


Fig. 1.

p. 443.



sometimes had such a Discharge, as to wet the Place she sat upon thro' all her Petticoats, &c.

For some Months before we were concerned for her, she began to complain of a Pain and Weight in the *Uterus*; which increased as the Substance grew in Bulk; and at last the Excrescence was so large as to appear outwards, and then it grew very fast.

The Patient consulted her Midwife, who thought the Womb had come out; but was so prudent as not to do any thing; and desired they would call in better Advice. Accordingly they sent for Mr. *Nell*, an eminent Man-midwife and Surgeon in this City; who, not having met with a Case like that, desir'd me also to go and see her; which was in *December* last (1749). The Substance not only fill'd, but extended, the Entrance into the *Vagina*. I introduced a Finger into the Passage, and soon found the Excrescence to be less in Bulk there than what appear'd without the Body; and to be in Shape as you see in the Drawing. I follow'd the Substance till I reach'd the *Os Uteri*, which I found chiefly fill'd up, with the Neck or smallest Part of this Substance, leaving only a small Part of the *Os Tincæ* to be perceived on the left Side, obliquely towards the Back. I tried to penetrate the *Os Tincæ* with the End of my Finger, but could not; however, I so far open'd it, as to let out a sort of bloody *Ichor*, which was a little offensive in Smell.

I asked her, if, when her Discharges were so large as to wet her Seat, they diss'd in Smell from those which came in less Quantities; and if they smelted something like what then came from her when I search'd her, which she answer'd in the Affirmative: From whence I concluded she had an Ulcer

cer just within the *Os Uteri*, from the Edge of which this *Fungus* or Excrecence grew. The Patient complain'd of Pain in the *Uterus* and Back, was very faint, and frequently was provoked to vomit, with a feeble Pulse, and sometimes Sweat.

Upon Consultation, we thought proper to tie a Ligature as high up within the *Vagina* as the Surgeon could reach: Which being done, and some internal Medicines being order'd, we return'd home; and in two or three Days we went again, but found no great Alteration as to the uterine Complaint; except that the Part below the Ligature was somewhat more livid, and the fetid Smell was much greater, and very like that of a confirmed running Cancer: And as the Matter was somewhat confin'd in the Passage, I order'd them to wash the *Vagina* by an Injection made of the common emollient Decoction, with *Mel Rosarum* and a little *Tinct. Myrrhæ*. This was frequently done; by which the Smell was less offensive; and two Days after the Excrecence dropp'd off at the Ligature.

The Patient has since, in part, recover'd her Strength; tho' she is not in a good State of Health, and her *Fluor albus*, as she calls it, is still troublesome to her.

This was the last Account I have had of her. The Excrecence was very solid, of a dark liver Colour, and, whilst adhering to the *Uterus*, was quite insensible. When cut in two, it resembled the solid Substance that is taken out of Cancers. I am,

S I R,

York, March 28,
1750.

Your very humble Servant,

John Burton,

PHILOSOPHICAL TRANSACTIONS.

For the Months of *November* and *December*, 1750.

The CONTENTS.

- I. *An Account of the Eclipse of the Moon, June 8, 1750. observed in Surry-street. in the Strand; by Mr. John Catlin and Mr. James Short, F. R. S. Likewise an Observation determining the Longitude of Kingston in Jamaica.* p. 523
 - II. *A Continuation of the Experiments on Substances resisting Putrefaction; by John Pringle M. D. F. R. S.* p. 525
 - III. *A Letter from Mr. Joseph Platt to Mr. Peter Collinson F. R. S. concerning a flat Spheroidal Stone having Lines regularly crossing it.* p. 534
 - IV. *A Letter from Arthur Dobbs Esq; to Charles Stanhope Esq; F. R. S. concerning Bees, and their Method of gathering Wax and Honey.* p. 536
- V.

The CONTENTS.

V. *Further Experiments on Substances resisting Putrefaction; with Experiments upon the Means of hastening and promoting it; by John Pringle M. D. F. R. S.* p. 550

VI. *A Letter from Mr. John Robertson to the President, containing an Explanation of the late Dr. Halley's Demonstration of the Analogy of the Logarithmic Tangents to the Meridian Line, or Sum of the Secants.* p. 559

VII. *Observatio Eclipsæ Lunariæ totalis cum mora, habita Wittembergæ, 1750. die 19 Junii, tubo 6 ped. pro correctione horologii, quadrante telescopico 18 digitorum, altitudin. Solis correspondent. die 19 Junii, per G. M. Bose, Physic. Prof. Wittembergæ, &c.* p. 570

VIII. *Two Letters from the Rev. Henry Miles F. R. S. D. D. to Mr. Henry Baker F. R. S. concerning the Heat of the Weather in July and September last.* p. 571

IX. *Extract of a Letter from Mr. William Arderon F. R. S. to Mr. Henry Baker F. R. S. concerning the hot Weather in July last.* p. 573

X.

THE CONTENTS.

- X. *A total Eclipse of the Moon, observed Dec. 2. 1750. in the Morning; in the Strand, London, about 5" of Time West of St. Paul's, and 27" West of the Royal Observatory at Greenwich; by Dr. Bevis and Mr. James Short F. R. S.* p. 575
- XI. *An Account of some Experiments, made by Benjamin Robins Esq; F. R. S. Mr. Samuel Da Costa, and several other Gentlemen, in order to discover the Height to which Rockets may be made to ascend, and to what Distance their Light may be seen; by Mr. John Ellicott F. R. S.* p. 578
- XII. *Several Papers concerning a new Semi-Metal, called Platina; communicated to the Royal Society by Mr. Wm. Watson F. R. S.* p. 584
- XIII. *An Account of a very large human Calculus, by William Heberden M. D. F. R. S. and Fellow of the College of Physicians, London.* p. 596
- XIV. *A Letter from the Rev. Charles Lyttelton LL.D. and F. R. S. Dean of Exeter, to the President, concerning a non-descript petrified Insect.* p. 598
- XV.

The CONTENTS.

- XV. *Some further Account of the before-mentioned petrified Insect, by the Editor of these Transactions.* p. 600
- XVI. *The Description and Figures of a small flat spheroidal Stone, having Lines formed upon it; by C. Mortimer, M.D. & Secret. R. S.* p. 602ⁱ

Printed for C. DAVIS, *Printer to the ROYAL SOCIETY*, over-against *Gray's-Inn-Gate* in *Holborn*. M.DCC.LI.

- I. *An Account of the Eclipse of the Moon, June 8, 1750. observed in Surry-street in the Strand; by Mr. John Catlin and Mr. James Short, F. R. S. Likewise an Observation determining the Longitude of Kingston in Jamaica.*

Read Nov. 1.
1750.

WE expected to have seen the Moon rise eclipsed before the Setting of the Sun; but were prevented by Clouds. About half an Hour after 9 o' Clock, we saw the Moon then totally eclipsed; tho' considerably brighter on the East than on the West Side; by which we found that she was then past the middle of the Eclipse.

	h.	'	"
Emerfion, or End of total Darknefs, at	9	45	0
End of the Eclipse at	10	51	30

Here follows a Computation of the same Eclipse by Mr. *John Catlin* from Dr. *Halley's* Tables, which he fays was done in a Hurry; however he knows of no Error in the Calculation.

	h.	'	"
Beginning at	7	14	25
Immerfion at	8	21	20
True Opposition at	9	0	24
Emerfion at	9	45	52
End at	10	52	53

I take this Opportunity of laying before the *Society* two Observations proper for determining the Difference of Longitude between *London* and

X x x

Kingston

Kingston in *Jamaica*, which came to my Hands some time since. They were made by *Alexander Macfarlane* Esq; of *Kingston* in *Jamaica*, a Fellow of this *Society*, who is provided with a complete *Apparatus* of astronomical Instruments, which he purchased of *Colin Campbell* Esq;. As this Gentleman is well versed both in the Theory and Practice of Astronomy, I think the following Observations may be depended on for fixing the Longitude of *Kingston*; especially as we have the same Observations made at the House of Mr. *George Graham* in *Fleetstreet*, *London*, and already published in the *Philosophical Transactions*, N^o. 471, p. 580, 578.

Eclipse of the Moon, October 22, 1743.

	h / m.
Beginning of total Darkness at	- - 9 10 58
End of the Eclipse at	- - 10 51 33

Transit of Mercury over the Sun, Oct. 25, 1743.

The Ingress of *Mercury* upon the Sun could not be seen, the Sun being then below the Horizon.

Excessus e disc. Solis, on the last exterior Contact, at 17^h 56' 43" a. m.

By the first Observation of the Eclipse of the Moon, compared with the same Eclipse observed here, *Kingston* is found to be 5^h 6' 2" to the West of *London*.

And by the *Transit of Mercury* neglecting his Parallax, *Kingston* is found to be 5^h 5' 33".

This last is the most to be depended on for settling the Longitude of *Kingston*; because in all Observations of an Eclipse of the Moon, an Error

of a Minute or two may be allowed, arising from the Indistinctness of the *Penumbra*.

II. *A Continuation of the Experiments on Substances resisting Putrefaction; by John Pringle M. D. F. R. S.*

Read Nov. 1.
1750.

HAVING in my last Paper in the preceding Number of these *Transactions*, p. 480, &c. just mentioned the comparative Force of a few Salts, and other Substances resisting Putrefaction, I shall now lay before the *Society* a more particular Account of those Experiments, with some others, since made, on that Subject.

1. Three Pieces of the Lean of fresh Beef, each weighing two Drachms, were put separately into wide-mouth'd Phials. Two Ounces of Cistern-Water were added to each; in one were dissolved 30 Grains of Sea-Salt; in another 60; but the third contained nothing but Flesh and Water. These Bottles were little more than half-full; and, being corked, were placed in a Lamp-Furnace, regulated by a Thermometer, and kept about the Degree of human Heat.

About ten or twelve Hours after, the Contents of the Phial without Salt had a faint Smell; and in three or four Hours more were putrid*. In an Hour

* It is to be observed, that these Pieces were all intire; but when they are beat to the Consistence of a Pap, with the same Quantity of Water, the Putrefaction then begins in less than half the Time mentioned here.

Hour or two longer the Flesh with the least Salt was tainted; but that which had most, remained sweet above 30 Hours after Infusion. This Experiment was often repeated with the same Result, making Allowance for Variations of the Degree of Heat.

The Use of this Experiment was for making Standards, whereby to judge of the septic or antiseptic Strength of Bodies. Thus, if Water with any Ingredient preserved Flesh better than without it, or better than with the Additions of the Salt, that Ingredient might be said to resist Putrefaction more than Water alone, or with 30 or 60 Grains of Sea-Salt. But if, on the other hand, Water, with any Addition, promoted Corruption more than when pure, the Substance added was to be reckoned a Septic, or Hastener of Putrefaction.

The following Experiments were therefore all made in the same Degree of Heat with the Quantity of Flesh, Water, and Air, as above specified; together with such septic or antiseptic Substances, as shall be afterwards mention'd, and were all compared with the Standards. But whereas the least Quantity of Salt preserved Flesh little longer than plain Water, I shall always compare the several antiseptic Bodies with the greatest Quantity of Salt; so that whenever any Substance is said to oppose Putrefaction more than the Standard, I mean, more than 60 Grains of Sea-Salt.

2. I began with examining other Salts, and compared them in the same Quantity with the Standard; which being of all the weakest, I shall suppose it equal to Unity, and express the proportional Strength of the rest in higher Numbers in the following Table.

*A Table of the comparative Powers of Salts in
resisting Putrefaction.*

Sea-Salt	.	.	.	.	.	.	1
<i>Sal Gemmæ</i>	.	.	.	.	.	.	1+
Tartar vitriolated	.	.	.	.	.	.	2
<i>Spiritus Mindereri</i>	.	.	.	.	.	.	2
<i>Tartarus solubilis</i>	.	.	.	.	.	.	2
<i>Sal diureticus</i>	.	.	.	.	.	.	2+
Crude <i>Sal Ammoniac.</i>	.	.	.	.	.	.	3
Saline Mixture	.	.	.	.	.	.	3
Nitre	.	.	.	.	.	.	4+
Salt of Hartshorn	.	.	.	.	.	.	4+
Salt of Wormwood	.	.	.	.	.	.	4+
Borax	.	.	.	.	.	.	12+
Salt of Amber	.	.	.	.	.	.	20+
Alum	.	.	.	.	.	.	30+

In this Table I have mark'd the Proportions by integral Numbers; it being hard, and perhaps unnecessary, to bring this Matter to more Exactness; only to some I have added the Sign +, to shew, that those Salts are stronger than the Number in the Table by some Fraction; unless in the three last, where the same Sign imports that the Salt may be stronger by some Units†. The Tartar vitriolated
is

† Five Grains of Borax was the smallest Quantity compared with Sea-Salt; but holding out so much longer, I suspect three Grains would have been sufficient; in which Case the Force of this Salt was to be estimated at 20: A singular Instance of the Strength of

is rated at 2 ; tho' more than 30 Grains of it was taken to equal the Standard: But perceiving all of it was not dissolved, an Allowance was made accordingly. On the other hand, as Part of the Har's-horn flies off, its real Force must be greater than what appears by the Table. The Salt of Amber is likewise volatile ; and as three Grains of it were found more preservative than 60 Grains of Sea-Salt ; it may therefore be much more than 20 times stronger. This is indeed an acid Salt ; but as the acid Part of it is inconsiderable, this high antiseptic Power must be owing to some other Principle. The *Spiritus Mindereri* was made of common Vinegar and Salt of Hartshorn ; the saline Mixture of Salt of Wormwood saturated with Lemon-juice. The alkaline Part in either of these Mixtures with Water only would have resisted with a Power of 4 $\frac{1}{2}$; so that the Acid added render'd these Salts less antiseptic ; viz. the *Spiritus Mindereri* by a Half, and the saline Mixture by a third Part : Which was a Circumstance very unexpected.

3. Next I proceeded to try Resins and Gums, and began with Myrrh. As Part of this Substance dissolves in Water, eight Grains were made into an Emulsion ; but most of it subsiding, I could not reckon on a Solution of more than one or two Grains ; which nevertheless preserving the Flesh longer than the Standard, we may account the soluble
Part

Salt not acid. One Grain of Alum was weaker than 60 Grains of Sea-Salt ; but two Grains were stronger. The Power therefore of Alum lies between 30 and 60 ; but, as I could judge by the Experiment, nearer the first Number.

Part of Myrrh perhaps about 30 times stronger than Sea-Salt.

Aloes, *Asa fetida*, and the *Terra Japonica*, dissolved in the same manner as Myrrh, like it subsided, and with the same antiseptic Force. But Gum ammoniac and *Sagapenum* shewed little of this Virtue. Whether it was that they opposed Putrefaction less, or that all the antiseptic Principle fell with the grosser Parts to the Bottom. Three Grains of Opium dissolved in Water did not subside, and resisted Putrefaction better than the Salt. But I observed that more Air than usual was generated, and the Flesh became tenderer than with any of the stronger Antiseptics.

Of all the resinous Substances Camphire resisted most: Two Grains dissolved in one Drop of Spirit of Wine, five Grains of Sugar, and two Ounces of Water exceeded the Standard: Tho', during the Infusion, most of the Camphire flew off, swam a-top, or stuck to the Phial. Suppose only the Half lost, the Remainder is at least 60 times stronger than Salt; but if, as I imagine, the Water suspended not above a tenth Part, then Camphire will be 300 times more antiseptic than Sea-salt. That nothing might be ascribed to the minute Portion of the Spirit, used in this Experiment, I made another Solution of Camphire in a Drop or two of Oil, and found this Mixture less perfect, but still beyond the Standard.

4. I made strong Infusions of Camomile-flowers, and of *Virginian* Snake-root; and finding them both greatly beyond the Standard, I gradually lessened the Quantity of these Materials, till I found five Grains of either impart a Virtue to Water superior

to 60 Grains of Salt. Now as we cannot suppose these weak Infusions contained half a Grain of the embalming Part of these Vegetables, it follows, that this must be at least 120 times more antiseptic than common Salt.

I also made a strong Decoction of the Bark, and infused a Piece of Flesh in two Ounces of it strained; which Flesh never corrupted, tho' it remained two or three Days in the Furnace, after the Standard was putrid. In this time the Decoction became gradually limpid, whilst the grosser Parts subsided: By which it appears, that a most minute Portion of the Bark intimately mixed with Water (perhaps less than of the Snake-root, or Camomile-flowers) is possessed of a very extraordinary antiseptic Force.

Besides these, Pepper, Ginger, Saffron, Contrayerva-root, and Galls, in the Quantity of 5 Grains each, as also 10 Grains of dried Sage, of Rhubarb, and the Root of wild Valerian *, separately infused, exceeded 60 Grains of Salt. Mint, Angelica, Ground-ivy, Senna, Green Tea, red Roses, common Wormwood, Mustard, and Horse-radish, were likewise infused, but in larger Quantities, and proved more antiseptic than the Standard. And as none of these can be supposed to yield in the Water above a Grain or two of the embalming Principle, we may look upon them all as very powerful Resisters of Putrefaction. Farther, I made a Trial with a Decoction
of

* Tho' the Experiment was only made with ten Grains of the Powder of this Root, yet, considering how long that Quantity resisted Putrefaction, we may reckon the Valerian among the strongest Antiseptics.

of white Poppy-heads, and another with the expressed Juice of Lettuce, and found them both above the Standard.

By these Specimens we may now see how extensive Antiseptics are; since, besides Salts, fermented Spirits, Spices and Acids, commonly known to have this Property, many Resins, Astringents, and Refrigerants, are of the Number; and even those Plants called Anti-acids, and supposed Hasteners of Putrefaction; of which Class Horse-radish is particularly antiseptic. And indeed after these Trials, I expected to find all dissolvable Substances endowed with some Degree of this Quality; till, upon further Experiments, I perceived some made no Resistance, and others promoted Corruption. But before I enter upon that Part of my Subject, it will be proper to relate some other Experiments more nearly connected with the preceding.

5. Having seen how much more antiseptic these Infusions were than Sea-Salt, I then tried whether Plants would part with this Virtue without Infusion. For this Purpose, having three small and thin Slices of the Lean of Beef, I rubbed one with the Powder of the Bark, another with Snake-root, and a third with Camomile-flowers. It was in the Heat of Summer, yet, after keeping these Pieces for several Days, I found the Flesh with the Bark but little tainted, and the other two quite sweet. The Substance of all the three was firm; particularly that with the Camomile, which was so hard and dry, that it seemed incorruptible. Why the Bark had not altogether the same Effect, was probably owing to its close Texture.

6. I have, also made some Attempts towards the sweetening of corrupted Flesh, by means of mild Substances; because distill'd Spirits, or strong Acids, the only things known to answer this Intention, were of too acrid and irritating a Nature to be thoroughly useful, when this Correction was most wanted, As for Salts, besides their Acrimony, it is well known, that Meat once tainted will not take Salt.

A Piece of Flesh weighing two Drachms, which in a former Experiment had become putrid, and was therefore very tender, spongy, and specifically lighter than Water, was thrown into a few Ounces of the Infusion of Camomile-flowers, after expressing the Air, to make it sink in the Fluid: The Infusion was renewed twice or thrice in as many Days; when, perceiving the *Fætor* gone, I put the Flesh into a clean Bottle, with a fresh Infusion; and this I kept all the Summer, and have it still by me, quite sweet, and of a firm Texture *. In like manner I have been able to sweeten several small Pieces of putrid Flesh, by repeated Affusions of a strong Decoction of the Bark; and I constantly observed, that not only the corrupted Smell was removed, but a Firmness restored to the Fibres.

Now, since the Bark parted with so much of its Virtue in Water, it was natural to think it would still yield more in the Body, when open'd by the *Saliva* and Bile; and therefore it was by this antiseptic

* This Piece has been kept a Twelvemonth in the same Liquor, and is still firm and uncorrupted.

septic Virtue it chiefly operated. From this Principle we might account for its Success in Gangrenes, and in the low State of malignant Fevers, when the Humours are so evidently putrid. And for Intermittents, in which the Bark is most specific, were we to judge of their Nature, from Circumstances attending them in Climates and Seasons most liable to the Distemper, we should assign Putrefaction as a principal Cause. They are the great Endemic of all marshy Countries, and rage most after hot Summers, with a close and moist State of Air. They begin at the End of Summer, and continue thro' Autumn; being at the worst, when the Atmosphere is most loaded with the *Effluvia* of stagnating Water, render'd more putrid by Vegetables and animal Substances that rot in it. At such times all Meats are quickly tainted; and Dysenteries, with other putrid Distempers, coincide with these Fevers. The Heats dispoſe the Humours to Acrimony; the putrid *Effluvia* are a Ferment; and the Fogs and Dew, so common to those Climates, stop Perspiration, and bring on a Fever. The more these Causes prevail, the easier it is to trace this Putrefaction of Humours. The Nausea, Thirst, bitter Taste, of the Mouth, and frequent Evacuations of putrid Bile, are common Symptoms and Arguments for what is advanced. We shall add, that in moist Countries, in bad Seasons, the Intermittents not only begin with Symptoms of a putrid Fever, but, if unduly managed, easily change into a putrid and malignant Form, with livid Spots and Blotches, and Mortification of the Bowels. But, as a thorough Discussion of this Question might carry us too far from our present Subject,

Subject, and be unseasonable here, I shall refer it to its proper Place, and only remark, that whatever Medicines (besides Evacuations and the Bark) have been found useful in the Cure of Intermittents, they are, so far as I know, all highly antiseptic; such are, Myrrh, Camphire, Camomile-flowers, Wormwood, Tincture of Roses, Alum with Nutmeg, vitriolic or strong vegetable Acids with Aromatics.

Thus far I have only related my Experiments upon Flesh, or the fibrous Parts of Animals; I should next proceed to shew, what Effects Antiseptics have upon the Humours; for, tho' from Analogy we may conclude, that whatever retards the Corruption of the Solids, or recovers them after they are tainted, will act similarly upon the Fluids; yet, as this does not certainly follow, I judged it necessary to make new Trials; which, with some Experiments on the Promoters of Putrefaction, the reverse of the former, shall be offer'd to the *Society* at another Meeting.

N. B. *These Experiments are continued in this Transaction, p. 550.*

III. *A Letter from Mr. Joseph Platt to Mr. Peter Collinson F. R. S. concerning a flat Spheroidal Stone having Lines regularly crossing it.*

Dear Sir,

Manchester, Dec. 9, 1749.

Read Nov. 8.
1750.

A LITTLE while since a Man brought me a Stone, which he found at *Ardwick*, 7 feet deep, near this Town, in driving a Slough through some Gretstone. It is what I call

a Nodule, of a close, compact, smooth Matter; was incrustated with coarser Earth, or soft Stone; is 3 Inches and a half Diameter; form'd not unlike one of the *Eckini marini*; except the *Papillæ* or small Protuberances, which it wants. Upon examining it, I find four white Seams, about the Bigness of a Horse-hair, which quarter the Stone very correctly. The Angles are exactly the same, and correspond so well, that it would require the nicest mathematical Head and Hand to draw the like. See TAB. I. *Fig. 1.*

The Diameter *AB* is 3.7 Inches; the strait Line *CD* at the Bottom, or greater Base, is .42 of an Inch; that at the Top of the Stone is .21 of an Inch, which make the Angles *CD* equal at Top and Bottom, tho' of different Diameters. The Seams are like Talc or Spar. It weighs about 3 Pounds. I have several Nodules, but none like this. There is nothing curious in this Stone but the Lines, which I have described in the best manner I can. I am confident Chance had no Hand in forming it; and I am as certain, that no Artist was ever concerned or able to do the like; therefore I conclude it has been something form'd before the Flood, and is of marine Production. I am

Your much obliged Friend,
and humble Servant,
 Joseph Platt.

The Stone having been since cut in two, it was found that those regular Lines, composed of a sparry Matter, penetrated the whole Substance of the Stone quite thro', and that they grew wider as they were nearer to the Centre. I have given a Representation of this Section at *Fig. 2. TAB. I.*

IV. *A Letter from Arthur Dobbs Esq; to Charles Stanhope Esq; F. R. S. concerning Bees, and their Method of gathering Wax and Honey.*

S I R,

Castle-Dobbs, Oct. 22, 1750.

Read Nov. 8.
1750.

SINCE my View of doing Good, by making Discoveries of the Great World has been disappointed, upon my Retirement into this little Corner of it, [Ireland] amongst other rural Amusements I have been contemplating the Inhabitants of the Little World; particularly that most useful and industrious Society of Bees; and have had Time to revise the curious, ingenious, and entertaining Account given by M. *Reaumur*, of that inimitable Insect, with his curious Remarks and Reasoning about them; since he has been indefatigable in his Experiments and Observations about them, as well as of most other Insects, I think it the Duty of every Person, who has had Time to make any Observations, which may contribute to come at the Truth, and complete his Natural History of Insects, to throw in his Mite towards it.

I had Leisure and Opportunities many Years ago, to make some Observations about Bees; and all that I made confirm his general Theory, as well from his microscopical Observations, as those made by means of glass Hives; in which he had much greater and better Opportunities to make Observations than I have had: However, as there are two Things, in which my Observations are different from his, I think

think it but Justice to the curious and learned World to mention them; that M. *Reaumur*, in case he be alive, and still able to follow his Observations, or, if he is not, that some other curious Person may make future Remarks, to know whether those I have made are true: As I must own myself diffident of my own Observations, when they differ from so accurate, minute, and careful an Observer, as he has shewn himself to be throughout his whole Theory of Insects in general, and more particularly of the Society of our Garden-Bee.

I therefore beg Leave to lay the few Remarks I have made before you, Sir; that if you think there is any thing in them worth communicating, you may lay them before the *Royal Society*, of which you are a worthy Member; or communicate them to M. *Reaumur*, if he be still alive, and follows his Observations; that, in case my Observations are found true, he may so far alter his Remarks; and if they are not confirm'd, I shall willingly submit to his future Observations.

The only two things in which I differ from M. *Reaumur*, are, that I apprehend he says, the Bees range from Flowers of one Species to those of another Species, whilst they are gathering one Load; so that the *Farina*, or crude Wax, loaded upon their Legs, is from different Species of Flowers; which is contrary to what I have observed. The other thing that I differ with him in is, that he says the Wax is formed in the Bee, from the crude Wax, or *Farina* (so far I agree with him): But by his Observations, he says, after Digestion it is discharged upwards by the Mouth; whereas, by my Observations,

is

it is the *Fæces*, Husks, or Shells of the *Farina* or crude Wax, after Digestion, discharg'd by the *Anus*.

As to the first, I have frequently follow'd a Bee loading the *Farina*, Bee-Bread, or crude Wax, upon its Legs, through a Part of a great Field in Flower; and upon whatsoever Flower I saw it first alight and gather the *Farina*, it continued gathering from that kind of Flower; and has pass'd over many o'her Species of Flowers, tho' very numerous in the Field, without alighting upon or loading from them; tho' the Flower it chose was much scarcer in the Field than the others: So that if it began to load from a Daisy, it continued loading from them, neglecting Clover, Honeyuckles, Violets, &c.; and if it began with any of the others, it continued loading from the same Kind, passing over the Daisy. So in a Garden upon my Wall-Trees, I have seen it load from a Peach, and pass over Apricots, Plums, Cherries, &c. yet made no Distinction betwixt a Peach and an Almond

Now M. *Reaumur*, in his Memoir upon the Bee's making Honey, mentions *Aristotle's* Observation of the Bee's loading or gathering from one Species of Flower without changing; not quitting a Violet to gather from a Cowslip; which he says is not justly founded; for he has observed frequently a Bee on a large Border gathering from Flowers of different Species. If M. *Reaumur* only means, that, when the Bee gathers Honey, it takes it indifferently from any Flower, I can say nothing against it; but, if he intends it to mean the Bee's loading the *Farina* upon its Legs, then my Observation directly contradicts it.

What

What further confirms my Observation is this, that each Load upon the Legs of a Bee is of one uniform Colour throughout, as a light Red, an Orange, a Yellow, a White, or a Green, and is not upon different Parts of the Load of a different Colour; so that as the *Farina* of each Species of Flowers, when collected together, is of one uniform Colour, the Presumption is, that it is gather'd from one Species. For, if from different Kinds, Part of the Load might be of one Colour, and Part of another.

Another Observation to confirm the same Fact is, that Bees, in the Height of the Season, return to their Hives with Loads of very different Magnitudes, some having Loads as great as small Shor, whilst others have very small Loads; it cannot be conceiv'd that this Difference is from the Inactivity or Sloth of the Bee in collecting its Load, but rather from the Scarcity of the Flowers, upon which it first began to load.

Now, if the Facts are so, and my Observations true, I think that Providence has appointed the Bee to be very instrumental in promoting the Increase of Vegetables; but otherwise, might be very detrimental to their Propagation; and at the same time they contribute to the Health and Life of their own Species.

From the late Improvement made by Glasses, and Experiments made, in observing the Works of Nature, it is almost demonstrable, that the *Farina* upon the *Apices* of Flowers is the Male Seed; which entering the *Pistillum* or *Matrix* in the Flower, impregnates the *Ovum*, and makes it prolific. It is often necessary to have Wind and dry Weather to

waft this *Farina* to the *Pistillum*, and from Flower to Flower, to make the Seed prolific: And we find in wet Seasons, that Grain, Nuts, and Fruit, are less prolific, by the *Farina's* not being properly convey'd to the *Pistillum*; and also in very hot dry Weather, from clammy Honey-Dews, or, more properly sweet Exsudations from the Plants themselves, which clogs the *Farina*, and causes Blasts and Mildews. Now, if the *Farina* of specifically different Flowers should take the Place of its own proper *Farina* in the *Pistillum*, like an unnatural Coition in the animal World, either no Generation would happen, or a monstrous one, or an Individual not capable of further Generation.

Now if the Bee is appointed by Providence to go only, at each Loading, to Flowers of the same Species, as the abundant *Farina* often covers the whole Bee, as well as what it loads upon its Legs, it carries the *Farina* from Flower to Flower, and by its walking upon the *Pistillum* and Agitation of its Wings, it contributes greatly to the *Farina's* entering into the *Pistillum*, and at the same time prevents the heterogeneous Mixture of the *Farina* of different Flowers with it; which, if it stray'd from Flower to Flower at random, it would carry to Flowers of a different Species.

Besides these visible Advantages, it may be of great Benefit to their own Species and Society; for, as this *Farina* is the natural and constant Food of the Bees, during one Half of the Year, and from this digested, as it is accurately observed by M. *Reaumur*, is the *Bouillée* and Jelly formed; which is lodg'd for the Food of the young Bees, until they become

Nymphæ:

Nymphæ: It is also necessary that Stores of it should be lodg'd in the Cells adjoining to the Honey, for their Winter Provision; without which Mr. *Reaumur* observes they would be in Danger of dying of a Looseness, their most dangerous Malady.

It seems therefore highly reasonable to believe, that different Kinds of *Farina* may have different physical Qualities: So that, by making Collections of the same kind in each Cell, they may have proper Remedies for themselves against Ailments we have no Knowledge of, which otherwise they would not have, if they were filled at random from all Kinds of Flowers. These further Advantages, directed to them by Providence, seem to add Weight to my Observations, and are a presumptive Proof that they are true.

The only thing, besides the former, wherein my Observations differ from Mr. *Reaumur*, is in the Manner the Wax is made and emitted by the Bee. I absolutely concur with him, that the Wax is formed by Digestion in the Bodies of the Bees, and is emitted by them, and then becomes Wax; and that it is almost impracticable to form Wax any other Way, unless the Wax extracted from the Myrtle-berries in *America* by boiling be an Exception from it.

By Mr. *Reaumur*'s Observations, he forms his Opinion, that after the Bee has fed upon the *Farina*, or Bee-Bread, and it has pass'd through the first Stomach (which is the Reservoir where the Honey is lodg'd, from whence it is discharg'd upwards, by its Mouth into the Wells) it is convey'd into the second Stomach, and yet, when there, great Part of it continues in its Spherical or oval Form, still undigested,

as view'd by him with his Glasses; and consequently must be convey'd further, before it be thoroughly digested, and the Particles broke; yet this he supposes is reconvey'd upwards through both the Stomachs, and is emitted by its Mouth; and forms his Judgment from his Observation, that the Bee, when working, and finishing the Cells, nips with its Teeth the Wax, where it is too thick, or wrong laid; and has observed a Motion of its Tongue as it were smoothing or laying on more Materials, which he thinks must be then discharg'd from the Stomach by its Mouth.

What makes me disagree with him in his Opinion and Observations, is from the Remarks I have made, that the *Fæces* of the Bee discharg'd by the *Anus*, after the *Farina* is digested, is the true Wax. We may with Truth believe, that the *Farina*, which is the male Seed of all Vegetables, consists of a Spirit or moving Principle, floating in a sweet Oil, surrounded by an exterior Coat or Shell, in which is the *Almonade* that impregnates the Grain or Fruit, and makes it prolific; that, upon Separation or Digestion, this Spirit and Sweet Oil becomes the Nourishment of the Bee; which Spirit is of the same Nature with the Animalcules in *semine masculino* of Animals, and becomes the animal Spirits in the Bee and other Animals; and perhaps the true Honey is the sweet Oil included in the *Farina*: And as all Vegetables abound with these vegetable vivifying Atoms, since, from many, every Bud is capable of increasing each Species, so the true Honey breaking through its Shell by great Heat, occasions those Honey-Dews observ'd in hot Weather upon the Leaves and Flowers

Flowers of most Vegetables; which is no more than an Exsudation from the Leaves and Blossoms of these Vessels that break with the Heat; besides those that appear on the *Apices* of Flowers, which afterwards impregnates the Fruit.

Of this inward Substance of the *Farina*, diluted with Water, after Digestion, is formed the *Bouillée* and Jelly, which the Bees discharge upwards by the Mouth, into the Cells, to nourish the young Bees until they become *Nymphæ*; whilst the Husk or outer Coat is discharg'd by the *Anus*, and becomes the genuine Wax.

I have frequently, when Bees have been swarming, had them alight upon my Hands and Cloaths; and many, at different times, have discharged their *Fæces* thereupon: This I have taken off, and found it of the Consistence of warm Wax, with the same glutinous adhering Quality, not crumbling like the *Farina*. I have also distinguish'd it by the Smell to be Wax; but it had a heavier stronger Smell, as it was fresh and warm from the Bee.

What further confirm'd me in this Fact, was from my Observation of the Bees when working up their Comb in a glass Hive; where I have constantly seen (and must believe it impossible not to be observed by so accurate an Observer as M. *Reaumur*) that several Bees, soon after one another, have by hasty Steps, walk'd along a Comb then forming, for the Length of two or three Cells, bending their Tails to the Comb, and striking it with a wriggling Motion from Side to Side, in a zigzag Way; which I was convinced was discharging their *Fæces*, or the Wax, against the Border of the Cells, as they

they ran along, and repeated it as long as they had any to discharge, and then quit it; which is the Reason why the outward Border of the Cells is so thick and strong: And immediately afterwards, other Bees came along the Cells, and with their fore Feet rais'd up the Borders like Paste, and thinning it, whilst other Bees were ripping off with their Teeth, and pruning away any irregular Excrefcences, so as to make the Divisions of the Cells vastly thinner than the Borders or Edges, which were always thick and strong, from the discharging the *Fæces* or Wax upon them.

M. *Reaumur* has very justly observed, that, besides the three transparent smooth Eyes, which the Bee has placed in a Triangle betwixt the *Antennæ* on the Top of its Head, the Bee has also on each Side of its Head an Eye, or rather a Multitude of Eyes, form'd by a Number of distinct *Lens's* surrounded each with short Hairs, which are confirm'd to be Eyes, both from *Swammerdam*, and his own Experiments to determine it; and that, notwithstanding these *Lens's* are lin'd with a dark opaque Substance, yet they assist so much their Vision, that, when darkened by Paint laid over them, the Bees could not find their Way to their Hive, tho' at a small Distance, but soar'd directly upwards; nor could they find their Way when the three smooth Eyes were darkened.

But there is one Observation, which I don't find he has made, which may have determined the Garden Bees to make almost all their Cells imperfect Hexagons. The Observation is this; that these opaque Eyes on each Side of the Head, consist of many *Lens's*, each of which is a perfect Hexagon; and the whole

whole Eye, when view'd in a Microscope, appears exactly like a Honeycomb : Now, as the Eyes compos'd of these hexagonal *Lens's*, are in full View to the other Bees, does it not seem that Providence has directed them so as to be a Pattern set before them, for the Bees to follow in forming their Combs? Is it not also reasonable to believe, from the Disproportion of the Convexity betwixt the three smooth transparent Eyes, and the *Lens's* of the dark rough Eyes, that they are appointed for different Purposes? why may it not be thought that the *Lens's* are great Magnifiers, to view things nigh at hand, and by many Reflexions to convey Light into the dark Hives, where Light is still necessary; and that the three other Eyes are to observe Objects at a great Distance, so as to conduct them abroad to Fields at a Distance, and back again to their Hives?

I agree with *M. Reaumur* in the Form and Use of the Fang or Tromp of the working Bee, and of the Use of the Mouth within the Teeth of the Bee; so that it does not suck, but laps or licks with its rough Fang or Tromp, like a Dog. But I have never observed the Bee nipping or breaking open the *Apices* of Flowers, to let out the *Farina*, when it is not fully blown or open; but have often with Pleasure observed the Bee gathering the *Farina* upon its Fang, by licking it off the *Apices*, and laying it upon the first Pair of Legs, which convey it to the second Pair, and these lodge it upon the Pallet of the third Pair, with surprising Briskness; so that, by the time the second Pair has lodg'd it upon the third Pair, the Bee has gather'd more, and lodg'd it on the fore Legs; so that all are in constant Motion.

From

From the curious Observations made by M. *Reaumur*, upon the Structure and Behaviour of the Queen or Mother-Bee, the Drone or Male Bee, and the working or Mule Bee, which is of neither Sex; from the Queen Bee's being so exceedingly prolific, as to lay from 30 to 40000 Eggs of working Bees in a Season; besides the Eggs of 800 Male Bees, and of eight or ten Queen or Mother Bees; and from the Coldness of the Male Bee, who so long resists the Caresses of the Queen or Female Bee; and also from the indefatigable Labour and Oeconomy of the working Bee, to nourish the young Bees, make up the Combs, and lay in Stores of *Farina* and Honey for Winter. I think very good Reasons may be given why the Queen should have a Seraglio of some Hundreds of Male Bees; and why the working Bee should destroy the Males, when no longer necessary to impregnate the Eggs of the Mother Bee.

It is evident, from the Oeconomy of the Garden Bee, that Providence has appointed that they should share their Store with Mankind, by making them so industrious in every Climate, as to provide, in tolerable Seasons, a Store of Honey and Wax, double of what is necessary for their Subsistence during the Winter, and of Combs for the Queen's laying her Eggs in Spring, before new Work can be made. From the vast Number of Eggs which the Queen lays in a Season, it is absolutely necessary that she should have a great Store of Male Sperm, to impregnate her Eggs; and as the Eggs are not sensibly large in her Body for 6 Months after her Coition with the Males, who die, or are killed, in *August*, and she does not begin to lay from that time till
February

February or *March*; it is therefore necessary that she should have a great Store of Male Sperm within her, to impregnate all the Eggs she lays from that time, until *June* or *July*, when young Drones or Males are hatch'd, who are not designed for her Use, but for the young Queens, who go off with the Swarms, or for the young Queen who succeeds the old one in the old Hive; since the Drones are great Feeders, and no Workers; and are of no Use, but to give a sufficient Store of Sperm to the Mother-Bee; as the working Bees have so many Enemies to deprive them of their Store, they can't be maintain'd during the Winter, even if their Life should last so long; and as it is probable each Male has but one Act of Coition with the Queen, as they are so cold, and take so much caressing before they act, and, by M. *Reaumur's* Observation, die soon after the Act is over, when, probably, their whole Store of Sperm is exhausted in that Act, as soon as the Queen has got as much Sperm lodg'd in the proper Reservoir, as is sufficient to impregnate all her future Eggs, the Males are no longer of Use; and if those who have acted, die, those who have not, being of no further Use, are killed by the working Bee, out of Oeconomy to save their Winter Store, when, probably, by Nature they could live but few Days more; as we find the Silk-worm Moth dies soon after the Eggs are laid, as well Males as Females. It seems therefore necessary that the Queen should breed so many Males, as, by one Act of Coition from each, may impregnate all her Eggs, and that the working Bee should dispatch them, as soon as that is over, and a Store is lodg'd.

There are two Vessels describ'd by *Swammerdam* in the Mother-Bee, whose Plate M. *Reaumur* has given in his Memoirs; one of which is plac'd betwixt the two Lobes of the *Ovarium*, which he supposes to be a Bladder to contain Air; the other is a spherical Vessel, seated close by the common Duct, in which the Eggs fall from the Lobes of the *Ovarium*, which he supposes is to ooze out a Juice to moisten the Eggs in their Passage. I take one of these, but most probably the last, to be the Reservoir and Repository of the Male Sperm, wherein it is lodg'd from the Act of Coition, until the Eggs are enlarg'd, and pass thro' the adjoining Duct from the two Lobes of the *Ovarium*.

Since the Preservation and Increase of Bees are evidently beneficial to the Public, I approve very much of M. *Reaumur's* Instructions in driving Bees from a full Hive into an empty one, in case it can be done time enough to have new Work, sufficient for the Queen to lay her Eggs in in Spring; since they can be fed at very little Expence, if Care be taken to keep them in a middle State of Stupefaction, neither too hot nor cold, during the Winter: But I approve much more of his castrating or sharing the Combs with the Bees, by taking the Combs best stor'd with Honey, and leaving those wherein are the *Nymphæ* and Bee-bread; but think in taking the Combs a safer and easier Way may be taken, than he directs: His Method is to stupefy the Bees with Smoke, to oblige them to croud together in the Crown of the Hive, and then turning up the Hive, and cutting out the Combs fill'd with Honey. Now I think, that turning up the full Hive, and setting an empty Hive upon it,

it, and driving the Bees into it, is preferable to smoking : For then a very few Bees will remain in the full Hive; and those few may be stupefied, and the Bees in the empty Hive being put on a Table, the Combs may be taken out and selected at leisure, without Hazard; and afterwards the empty Hive may be turn'd up, and their old Hive set over them, so that they will go up without Scruple into their former Hive, and repair their Work, by making new Combs : And if the Queen had not quitted the old Hive, as is often the Case, then they would return to their Queen, and the Society would not be lost, as is sometimes the Case, in driving into an empty Hive.

These, Sir, are the few Remarks I have made on revising M. *Reaumur's* curious Observations on Bees, which I thought incumbent upon me to send you, to lay before your Learned *Society*, if it may contribute towards finishing the Natural History of Bees. I shall take up no more of your Time, than to assure you, that I am, with the greatest Regard,

S I R,

Your most obedient, and most humble Servant,

Arthur Dobbs.

V. *Further Experiments on Substances resisting Putrefaction; with Experiments upon the Means of hastening and promoting it; by John Pringle M. D. F. R. S.*

Read Nov. 15, 1750. **H**AVING given a particular Account of the Manner of trying Antiseptics on the fibrous Parts of Animals *, I shall only mention the Result of some Experiments made with them upon the Humours.

1. Decoctions of Wormwood and of the Bark, also Infusions of Chamomile-flowers, and of Snake-root preserved Yolks of Eggs, not only several Days longer than Water did alone, but also when a good Quantity of Sea-Salt was added to it. I likewise found that Salt of Hartshorn preserved this Substance better than four times its Weight of Sea-Salt.
2. Ox's Gall was kept some time from Putrefaction by small Quantities of Lye of Tartar, Spirit of Hartshorn, crude *Sal Ammoniac*, and the saline Mixture, and still longer by a Decoction of Wormwood, Infusions of Camomile-flowers, and of Snake-root; by Solutions of Myrrh, Camphire, and Salt of Amber: All were separately mixed with Gall, and found more antiseptic than Sea-Salt; and seemingly in proportion to their Effects upon Flesh. Only Nitre failed; which, tho' four times stronger than Sea-Salt in keeping Flesh sweet, is inferior to it in preserving Gall; and remarkably weaker than crude *Sal Ammoniac*; which again is somewhat less powerful than

* See this *Transaction*, p. 525, &c.

than Nitre in preserving Flesh. The Nitre was soon opened by the Gall, and emitted a vast Quantity of Air, which rose as from a fermenting Liquor; and when this happened, the Gall began to putrefy. But the saline Mixture generated no Air, and opposed the Putrefaction of Gall more than it did that of Flesh.

3. The last Trial was with the *Serum* of human Blood, which was preserved by a Decoction of the Bark, and an Infusion of Snake-root, nor with less Efficacy than Flesh. But Saffron and Camphire were not here above a fourth Part so antiseptic as before; whether it be that they are less preservative of this Humour, or, as I suspect, that they were not well mixed. Nitre acted nearly with its full Force, being about four times stronger than Sea-Salt: It generated some Air, but much less than it did with the Gall. No other Humour was tried; but, from these Specimens added to the former Experiments, we may conclude, that whatever is preservative of Flesh will be generally antiseptic, tho' perhaps not always with equal Force.

4. Having already shewn how putrid Flesh might be sweetened, I shall conclude this Part of my Subject with a like Trial upon the Yolk of an Egg. A Portion of this, being diluted with Water, stood till it corrupted; when a few Drops were put into a Phial with two Ounces of pure Water, and about twice as many Drops were mixed with a strong Infusion of Camomile-flowers. At first both Phials had some Degree of a putrid Smell; but being corked, and kept a few Days near a Fire, the Mixture with
plain

plain Water contracted a strong *Fætor*, whilst the other smelled only of the Flowers.

Thus far have I related the Experiments made of Antiseptics; by which it appears, that, besides Spirits, Acids, and Salts, we are possessed of many powerful Resisters of Putrefaction, endued with Qualities of heating, cooling, Volatility, Astringion, and the like, which make some more adapted than others to particular Indications. In some putrid Cases, many proper Antiseptics are already known; in others they are wanting. We are yet at a Loss how to correct the *Sanies* of a cancerous Ulcer; but, from such a Multitude of Antiseptics, it is to be hoped some may be found at last adequate to that Intention. It may be farther remarked, that, as different Distempers of the putrid kind require different Antiseptics, so the same Disease will not always yield to the same Medicine. Thus the Bark will fail in a Gangrene, if the Vessels are too full, or the Blood sily: But, if the Vessels are relaxed, and the Blood resolved or disposed to Putrefaction, either from a bad Habit, or the Absorption of putrid Matter, then is the Bark a good Specific. With the same Caution are we to use it in Wounds; *viz.* chiefly in Cases of absorbed Matter, which infects the Humours, and induces a hectic Fever. But, when inflammatory Symptoms prevail, the same Medicine increasing the Tension of the Fibres, and Sickness of the Blood, a State directly opposed to the other, has such Consequences as might be expected.

By the Success of the Bark in so many putrid Cases, it should appear that Astringion had no small Share in the Cure. And indeed the very Nature of
Putrefaction

Putrefaction consists in a Separation or Disunion of the Parts. But as there are other Cases, in which Astringency is less wanted, we may find in Contrayerva-root, Snake-root, Camphire, and other Substances, a highly antiseptic Power, with little or none of the other Quality. And since several of these Medicines are also diaphoretic, their Operation is thereby render'd more successful.

I come now to the last thing proposed, which was, to give an Account of some Observations made on Substances hastening or promoting Putrefaction; an Inquiry not less useful than the former. For, setting aside the offensive Idea commonly annexed to the Word, we must acknowledge Putrefaction to be one of the Instruments of Nature, by which many great and curious Changes are brought about. With regard to Medicine, we know, that neither animal nor vegetable Substances can become Aliment, without undergoing some Degree of Putrefaction. Many Distempers proceed from a Deficiency of this Action. The *Crisis* of Fevers seem to depend upon it; and perhaps even animal Heat, according to a late ingenious Theory *.

But, in the Prosecution of this Subject, I have met with very few real Septics; and found many Substances, commonly accounted such, of a quite opposite Nature. The most general means of accelerating Putrefaction is, by Heat, Moisture, and stagnating Air; which being sufficiently known and ascertained, I
passed

* An Essay on the Cause of animal Heat, by J. Stevenson, M. D. *Vide* Medical Essays, Vol. V.

passed over, without making any particular Experiment on those Heads. Lord *Bacon* *, as well as some of the Chemists, has hinted at a putrid Fermentation, analogous to what is found in Vegetables; and this having so near a Connexion with Contagion, I made the following Experiment, for a further Illustration of this Matter.

5. In the Yolk of an Egg, already putrid, a small Thread was dipped, and a small Bit of this was cut off and put into a Phial, with Half of the Yolk of a new-laid Egg diluted with Water. The other Half, with as much Water, was put into another Phial, and both being corked, were set by the Fire to putrefy. The Result was, that the Thread infected the fresh Yolk; for the Putrefaction was sooner perceived in the Phial that contained it, than in the other. But this Experiment was not repeated.

In this manner the Putrefaction of Meat advances quicker in a confined than a free Air; for, as the most putrid Parts are also the most fugitive; they incessantly issue from a corruptible Substance, and disperse with the Wind; but in a Stagnation of Air, they remain about the Body; and by way of Ferment excite it to Corruption.

6. As for other Septics, recited by Authors, I found none of them answer the Purpose. The alkaline Salts have been consider'd as the chief Putrefiers. But this is disproved by Experiments. Of the Volatiles it may be indeed observed, that, tho' they preserve from the common Marks of Putrefaction, with

* Vide *Nat. Hist. Cent. IV, Exper. 330.*

with a Force four times greater than that of Sea Salt; yet, in warm Infusions, a small Quantity of these Salts will soften and resolve the Fibres, more than Water does by itself. They also hinder the Coagulation of Blood; and when taken by way of Medicine, thin and resolve it, but are not therefore Septics. For, so little do these Salts putrefy, or even resolve the Fibres, when applied dry, that I have kept, since the Beginning of *June* last, notwithstanding the excessive Heats, a small Piece of Flesh in a Phial, preserved only with Salt of Hartshorn, at present perfectly sound, and firmer than when first salted.

7. From the Specimens we had of the antiscorbutic Plants, it is likewise probable none of that Tribe will prove septic. Horse-radish, one of the most acrid, is a very powerful Antiseptic. And tho' Carrots, Turneps, Garlick, Onions, Celery, Cabbage, and Colewort, were tried (as Alcalescents) they did not hasten, but somewhat retarded, the Putrefaction.

8. The Case was different with such farinaceous Vegetables as were examined; *viz.* white Bread in Infusion, Decoctions of Flour, Barley, and Oatmeal; for these did not at all retard Putrefaction; but, after it was somewhat advanced, they check'd it, by turning sour. By a long Digestion the Acidity became considerable; which, by conquering the Putrescency of the Flesh, and generating much Air, did not ill represent the State of weak Bowels, which convert Bread, and the mildest Grains, to such an Acid, as prevents a due Resolution and Digestion of animal Food *.

9.

* It is to be remarked, that, in making this Experiment, I did not then attend to a Fermentation that ensued, and which was the Cause

9. I examined *Cantharides*, dried *Vipers*, and *Russian Castor*, all animal Substances, and therefore most likely to prove septic. The Flies were tried both with fresh Beef, and with the *Serum* of human Blood; the *Vipers* only with the former; but neither of them hastened Putrefaction. And as for the *Castor*, so far from promoting this Process, that an Infusion of 12 Grains opposed it, more than the standard Salt.

10. After finding no Septics where they were most expected, I discovered some which seemed the least likely; viz. Chalk, the *Testacea*, and common Salt.

Twenty Grains of Crabs-eyes prepared, were mixed with 6 Drachms of Ox's Gall, and as much Water; into another Phial, was put nothing but Gall and Water, in the same Quantity with the former; and both being placed in the Furnace, the Putrefaction began much sooner, where the Powder was, than in the other Phial. I infused afterwards in the Lamp-Furnace 30 Grains of prepared Chalk, with the usual Quantity of Flesh and Water; and observed, that the Corruption not only began sooner, but went higher by this Mixture; nay, what had never happened before, that in a few Days the Flesh resolved into a perfect *Mucus*. The Experiment was repeated with the same Effect; which being so extraordinary, I suspected some corrosive Substance had been mixed with the Powder: But, for a Trial, a Lump of

Cause of the Acidity. This kind of Fermentation between animal and vegetable Substances, being hitherto overlooked, shall be therefore set forth in my next Paper.

of Chalk being pounded, 30 Grains of it proved fully as septic as the former. The same Powder was compared with an equal Quantity of Salt of Wormwood, and Care was taken to shake both the Mixtures alike: But, after three Days warm Digestion, the Salt had neither tainted nor soften'd the Flesh, whilst the Chalk had rotted and consumed that which was joined to it. Nor were the Effects less of the testaceous Powders of the Dispensary. Eggshells in Water resisted Putrefaction, and preserved the Meat longer firm, than plain Water*.

11. To try whether the *Testacea* would also dissolve vegetable Substances, I infused them with Barley and Water, and compared this Mixture with another of Barley and Water, without the *Testacea*. After a long Maceration by a Fire, the plain Water swelled the Barley, became mucilaginous and sour; but that with the Powder kept the Grain to its natural Size, tho' it softened it, made no Mucilage, and remained sweet.

12. Nothing could be more unexpected than to find Sea Salt a Hastener of Putrefaction. But the Fact is thus. One Drachm of Salt preserves two Drachms of fresh Beef, in two Ounces of Water, above 30 Hours, uncorrupted, in a Heat equal to that of the human Body; or, what amounts to the same, this Quantity of Salt keeps Flesh about 20 Hours longer sweet, than pure Water; but half a Drachm of Salt does not preserve it above 2 Hours longer. This Experiment has been already mentioned.

* The Trial was made with a coarse Powder, of this Substance, but not repeated.

tioned. Now I have since found, that 25 Grains have little or no antiseptic Virtue; and that 10, or 15, or even 20 Grains manifestly both hasten and heighten the Corruption*. It is moreover to be remarked, that in warm Infusions with these smaller Quantities, the Salt, instead of hardening the Flesh, as it does in a dry Form, in Brine, or even in Solutions, such as our Standard, it here softens and relaxes the Texture of the Meat, more than plain Water; tho' much less than Water with Chalk, or the testaceous Powders.

Many Inferences might be made from this Experiment; but I shall only mention one. Salt, the indispensable Seasoner of animal Food, has been supposed to act by an antiseptic Quality, correcting the too great Tendency of Meats to Putrefaction. But, since it is never taken in Aliment beyond the Proportion of the corrupting Quantities in our Experiment, it would appear that Salt is subservient to Digestion, chiefly by a septic Virtue; that is, by softening and resolving Meats; an Action very different from what is commonly believed.

* The most putrefying Quantity of Salt, with this Proportion of Salt and Water, is about 10 Grains.

VI. *A Letter from Mr. John Robertson to the President, containing an Explanation of the late Dr. Halley's Demonstration of the Analogy of the Logarithmic Tangents to the Meridian Line, or Sum of the Secants.*

S I R,

Read Nov. 22.
1750.

MY Curiosity having lately led me to peruse several Books on the Art of Navigation, I was somewhat surpris'd not to find in any one of them a clear Explanation of that most curious Paper in N^o 219. of the *Philosophical Transactions*, written by the excellent Mathematician Dr. *Halley*; who, not intending to write for Beginners, as himself confesses, has drawn his Conclusions in a manner, that seems to stand in need of an Explanation, for the Generality of Readers: And as the maritime People are not the best acquainted with mathematical Knowledge, it might have been expected, that such of the Writers on Navigation within the last 50 Years, who have undertaken to demonstrate the several Parts of their Subject, would have removed the Difficulties in the Doctor's Paper, instead of leaving them in the same State in which they first appeared.

Dr. *Halley*, in this Tract, seems to have had two chief Points in View; First, To prove, that *the Divisions of the Meridian Line in a Mercator's Chart,*

Chart, were analogous to the logarithmic Tangents of the Half-Complements of the Latitudes. And, secondly, To find a Rule by which the Tables of meridional Parts might be computed from Briggs's, or the common logarithmic Tangents. The former of these the Doctor has clearly and elegantly proved: But he has given rather too few Steps to shew as clearly the Investigation of the latter.

Indeed in many of the Treatises on Fluxions, it is shewn how to investigate a Rule to find the meridional Parts to any Latitude: But, to understand those Methods, requires some Skill in algebraical and fluxionary Computations; neither of which are necessary in this Business, by keeping to the Doctor's Principles, as will be evident from the following Articles; some of which are already well known; yet it was thought convenient to annex them to this Discourse, by

Your most humble Servant,

John Robertson.

Article I. If the Circumference of a Circle be divided into any Number of equal Parts by as many Radii, and a Line be drawn from the Circumference cutting those Radii, so that their Parts intercepted between this Line and the Centre be in a continued decreasing geometric Progression; then will that intersecting Line be a Curve, called the proportional Spiral, and will intersect those Radii at equal Angles.

This

This will be evident, by supposing the *Radii* so near to one another, that the intercepted Parts of the Spiral may be taken as right Lines: For then there will be a Series of similar Triangles, each having an equal Angle at the Centre, and the Sides about those Angles proportional.

Art. II. *The same things still supposed, the Parts of the Circumference of the Circle, reckoned from any one Point, may be taken as the Logarithms of the Ratio's between the corresponding Rays of the Spi al.*

For those Rays are a Series of Terms in a continued geometric Progression; and the Parts of the Circumference form a Series of Terms in arithmetic Progression. Now the Terms of the arithmetic Series being taken as the Exponents of the corresponding Terms in the geometric Series, there will be the same Relation between each geometric Term and its Correlative, as between Numbers and their Logarithms. And hence the proportional Spiral is also called the logarithmic Spiral.

Art. III. *That proportional Spiral, which intersects its Radii at Angles of 45 Degrees, produces Logarithms that are of Napier's Kind.*

For, if the Difference between the first and second Terms in the geometric Series was indefinitely small, and the first Division of the Circumference was of the same Magnitude; then may that Part of the Spiral, intercepted between the first and second *Radii*, be taken as the Diagonal of a Square, two of whose Sides are Parts of those *Radii*: Therefore the Spiral
which

which cuts its Rays at Angles of 45 Degrees, has a kind of Logarithms belonging to it, so related to their corresponding Numbers, that the smallest Variation between the first and second Terms in the geometric Series, is equal to the Logarithm of the second Term, a Cypher being taken for the Logarithm of the first. But of this kind are the hyperbolical Logarithms, or those first made by their Inventor the Lord *Napier*: Consequently the Logarithms to that Spiral which cuts its Rays at Angles of 45 Degrees, are of the *Napierian* Kind.

Art. IV. *The Rhumb-Lines on the Globe are analogous to the logarithmic Spiral.*

For every oblique Rhumb cuts the Meridian at equal Angles: And it is a Property in stereographic Projections, that the Lines therein intersecting one another, form Angles equal to those which they represent on the Sphere. Therefore a Projection of the Sphere being made on the Plane of the Equator, the Meridians will become the *Radii* of the Equator, and the Rhumbs intersecting them at equal Angles, will become the proportional Spiral.

Hence, the Arcs of the Equator, or the Differences of Longitude reckoned from the same Meridian, are as the Logarithms of those Parts of the corresponding Meridians, intercepted between the Centre and Rhumb-Line.

Art. V. *A Sea Chart being constructed, wherein the Meridians are parallel to one another, and the Lengths of the Degrees of Latitude increase in the same Proportion as the meridional Distances*

stances decrease on the Globes, will constitute a Mercator's Chart; wherein, besides the Positions of Places having the same Proportions to one another as on the Globes, the rhumb Lines will be represented by right Lines.

For none but right Lines can cut at equal Angles several parallel right Lines.

Art. VI. *The Divisions of the meridian Line on a Mercator's Chart, are the same as a Table of the Differences of Longitude answering to each Minute, or small Difference of Latitude on the rhumb Line making Angles of 45 Degrees, with the Meridians.*

For, in such a Chart, the Parallels of Latitude are equal to the Equator, and are at right Angles to the Meridians: And therefore a Rhumb of 45 Degrees cuts the Meridians and Parallels of Latitudes at equal Angles; consequently between the Intersection of any Meridian and Parallel, and a Rhumb cutting them at 45 Degrees, there must be equal Parts of the Meridian and Parallel intercepted: Now, on the Equator, or Parallels of Latitude, are reckoned all the successive Differences of Longitudes, and on the Meridians the successive meridional Differences of Latitudes, or the Divisions of the nautical Meridian: Therefore on the Rhumb of 45 Degrees, the successive Differences of Longitude are equal to the corresponding Divisions of the nautical Meridian.

Art. VII. *The Tangents of the Angles which different Rhumbs make with the Meridians, are directly proportional to the Differences of Longi-*

tudes made on those Rhumbs, when the meridional Differences of Latitudes are equal; or, are reciprocally proportional to unequal meridional Differences of Latitudes on those Rhumbs, when the Differences of Longitudes are equal.

For the meridional Difference of Latitude, is to the Difference of Longitude; as *Radius* is to the Tangent of the Angle of the Course, or of the Angle which the Rhumb makes with the Meridian. Therefore, when the meridional Differences of Latitudes are equal, the Differences of Longitudes are as the Tangents of the Courses: But, when the Differences of Longitudes are equal, the meridional Differences of Latitudes are reciprocally as the Tangents of the Courses.

Art. VIII. *The logarithmic Tangents of the Half-Complements of the Latitudes, are analogous to the lengthened Degrees in the nautical Meridian Line, in a Mercator's Chart.*

For, in the stereographic Projection of the Sphere on the Plane of the Equator, the Latitudes of Places are projected by the Half-Tangents of the Complements of those Latitudes, which Half-Tangents are the Rays of a proportional Spiral: Now, if a Series of successive Latitudes be taken on any Rhumb, the corresponding Differences of Longitudes will be Logarithms to the Rays of the Spiral, or to the Tangents of the Half-Complements of those Latitudes: Therefore the Differences of Longitudes are as the logarithmic Tangents of the Half-Complements of the Latitudes: But (*Art. VI.*) the lengthened Degrees on the
nautical

nautical Meridian are as the Differences of Longitudes on the Rhumb of 45 Degrees; consequently the logarithmic Tangents of the Half-Complements of Latitudes are as the lengthened Degrees on the nautical Meridian.

Corol. 1. When the Angle between the rhumb Line and the Meridian is equal to 45 Degrees, then the Longitudes of Places on that Rhumb are expressed by Logarithms of *Napier's* Kind; whose corresponding Numbers are natural Tangents of the Half-Complements of the Latitudes to Arcs expressed in Parts of the *Radius*.

Corol. 2. Hence, to any two Places on a Rhumb of 45 Degrees, the Difference of Longitude, or the meridional Difference of Latitude, is equal to the Difference of the *Napierian* logarithmic Tangents of the Half-Complements of the Latitudes of those Places, estimated in Parts of the *Radius*.

Corol. 3. As there may be an indefinite Variety of Rhumbs, and therefore as many different Kinds of Logarithms, consequently every Species of Logarithms has its peculiar Rhumb, distinguishable by

among three kinds, and two others, wherein the Differences of Longitudes are the Differences of the logarithmic Tangents of the Half-Complements of Latitudes, estimated in Minutes of a Degree, one of them belonging to *Napier's* Form of logarithmic Tangents, and the other to *Briggs's*, or the common logarithmic Tangents.

Art. IX. The common logarithmic Tangents are a Table of the Differences of Longitudes, to every

Minute of Latitude, on the rhumb Line making Angles with the Meridians of $51^{\circ} 38' 9''$.

For, let z represent the meridional Difference of Latitude between two Places on the Rhumb of 45 Degrees; or its Equal, the Difference between the logarithmic Tangents of the Half-Complements of the Latitudes of those Places, estimated either in Parts of the *Radius*, or in Minutes of a Degree. Then,

As. the Circumference in Parts of the *Radius*
 $= 62831,853 \text{ \&c.}$

To the Circumference in Minutes of a Degree
 $= 31699, \text{ \&c.}$

So is a meridional Difference of Latitude in Parts of the *Radius* $= z$.

To a meridional Difference of Latitude in Minutes of a Degree, $= 0,34377468 \text{ \&c.} \times z$.

Whose corresponding Rhumb is different from that which z belonged to; and the Angle which this Rhumb makes with the Meridian, will be found by the following Analogy from *Art. 7*.

As the meridional Difference of Latitude on one Rhumb $= 0,34377468 \text{ \&c.} \times z$.

To the meridional Difference of Latitude on a Rhumb of 45 Degrees, $= z$.

So is the natural Tangent of the Rhumb of 45 Degrees, $= 10000$.

To the natural Tangent of the other Rhumb,
 $= 29088,821, \text{ \&c.}$

Which Tangent answers to $71^{\circ} 1' 42''$; and this is the Angle that the rhumb Line makes with the Meridians, on which the Differences of the logarithmic Tangents

Tangents of the Half-Complements of the Latitudes, in *Napier's* Form, are the true Differences of Longitudes estimated in sexagesimal Parts of a Degree.

Now *Napier's* Logarithms being to *Briggs's* as 2,30258 &c. is to 1.

Therefore, 2,30258 &c. : 1 :: 29088,821 &c. : 12633,114 &c.; which is the Tangent of $51^{\circ} 38' 9''$; and in this Angle are the Meridians intersected by that Rhumb, on which the Differences of *Briggs's* logarithmic Tangents of the Half-Complements of the Latitudes, are the true Differences of Longitudes corresponding to those Latitudes.

Art. X. *The Difference between Briggs's logarithmic Tangents of the Half-Complements of the Latitudes of any two Places, to the meridional Difference of Latitude in Minutes between those Places, is in the constant Ratio of 1263,3 &c. to 1; or of 1 to 0,0007915704 &c.*

For *Briggs's* logarithmic Tangents are as the Differences of Longitudes on the Rhumb (*A*) of $51^{\circ} 38' 9''$; whose natural Tangent is 1263,3 &c.

The nautical Meridian is a Scale of Longitudes on the Rhumb (*B*) of 45 Degrees, by *Art. VI.* whose Tangent being equal to the *Radius*, may be expressed by Unity. And the Differences of Longitude to equal Differences of Latitudes on different Rhumbs, being to each other as the Tangents of the Angles those Rhumbs make with the Meridians. Therefore,

As the Tangent of *A* ($51^{\circ} 38' 9''$) = 1,2633, &c.
To the Tangent of *B* (45°) = 1,0000;

So

So is the Difference of Longitudes on *A*, or the Difference between the logarithmic Tangents of the Half Co-latitudes of two Places

To the Difference of Longitudes on *B*, or the meridional Difference of Latitudes of those Places.

And hence arise the Rules which are given in nautical Works, for finding the meridional Parts by a Table of common logarithmic Tangents.

This curious Discovery of Dr. *Halley's*, joined to that excellent Thought of his, of delineating the Lines, shewing the Variation of the Compass, on the nautical Chart, are some of the very few useful Additions made to the Art of Navigation within the last 150 Years: For if, beside these, we except the Labours of that ingenious Artist Mr. *Richard Norwood*, who improved the Art by adding to it the Manner of sailing in a Current, and by finding the Measure of a Degree on a great Circle, the Theory of Navigation will be found nearly in the same State in which it was left by that eminent Mathematician Mr. *Edward Wright*; who, about the Year 1600, published the Principles on which the true nautical Art is founded; and shewed, what does not appear to have been known before, how to estimate a Ship's true Place at Sea, as well in Longitude as in Latitude, by the Use of a Table of meridional Parts, first made by himself, and constructed by the constant Addition of the Secants, and which differs almost insensibly from such a Table made on Dr. *Halley's* Principles, contained in the preceding Articles.

I shall conclude this Discourse with an Article, which, altho' it be somewhat foreign to the preceding Subject, yet, as it was discover'd while I was contemplating

retemplating some Part thereof, and perhaps is not exhibited in the same View by others, it may not be improper to annex it in this Place: Which is to demonstrate this common logarithmic Property, that *the Fluxion of a Number divided by that Number, is equal to the Fluxion of the Napierian Logarithm of that Number.*

Let BEG be a logarithmic Spiral, cutting its Rays at Angles of 45 Degrees: Then, if AE be taken as a Number, BC will be its *Napierian* or hyperbolic Logarithm.

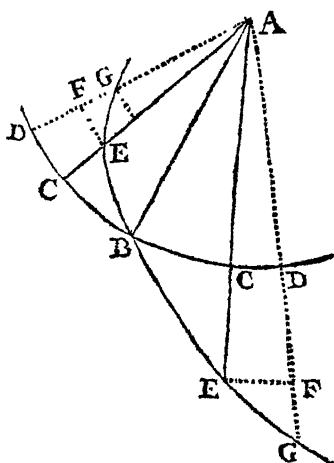
Also, let CD express the Fluxion of the Logarithm BC ; and the corresponding Fluxion of the Number AE , will be represented by FG , or its Equal FE ; as the Angles FEG and FGE are equal.

Now, $AC : CD :: AE : (EF =) FG$.

Therefore $CD = \frac{FG}{AE} \times AB$.

And if AB be taken as the Unit or Term from whence the Numbers begin :

Then $CD = \frac{FG}{AE}$ Q. e. d.



VII. Observatio Eclipses Lunaræ totalis cum mora, habita
Wittembergæ, 1750, die 19 *Junii*, tubo 6 ped. pro
 correctione horologii, quadrante telescopico 18 digitorum,
 altitudines Solis correspondentes die 19 *Junii*, per G. M.
Böse, Physic. Prof. *Wittembergæ*, &c.

Read Nov. 22, 1750.

h	'	"	alt. ☉ is	h	'	"	h	'	"	h	'	"		h	'	"
8	11	4	38° 34'	3	47	40	23	58	44	11	59	22	hinc meridies	11	59	26
12	30		38 44	46	9		58	39		59	19½	correctio ob declin. solis				3
18	17		39 40	40	31		58	48		59	24	meridies correct.	11	59	23	
20	23		40 0	38	39		59	2		59	31	et correctio horologii			+	37
23	30		40 25	35	17		58	47		59	23½					
27	36		41 0	31	23		58	59		59	29½					
29	4		41 15	30	2		59	6		59	33					

Cælum ortum versus densis semper nubibus tectum. Tandem
 temp. horol. temp. corr.

10	50	0	10	50	37	Luna ad momentum visibilis. Emerſio diu præterierat.			
	54	0		54	37	Aristarchus jam detectus.			
	58	13		58	50	partes lucidæ 3 ^{rev.} 220° hoc est	9'	49"	
11	0	22	11	0	59		4	75	11 26
	3	36		4	13		4	192	12 19
	6	3		6	40		5	37	13 52
	9	53		10	30		5	245	15 26
	12	1		12	38		5	349	16 13
	14	8		14	45		6	152	17 27
	16	9		16	46		6	321	18 43
	18	32		19	9		7	122	19 56
	20	40		21	17		7	265	21 1
	23	7		23	44		7	319	21 25
	25	16		25	53		8	55	22 9

Vix credo ex eclipsibus lunaribus differentiam meridianorum tuto erui.

temp. horol. temp. corr.

11	40	11	40	37	finis umbræ veræ, mihi.	
	40	40		45	17 finis, amico tubo quadrantis 1½ ped.	
				40	30 finis, ex projectione amici.	
				39	38 finis, ex calendario correcto Lips.	
				39	11 finis, suivant la Connoissance des temps.	
				39	46 finis, ex ephemeridibus Manfredii.	

adhibita differentia meridianorum quam 1743 per merc. in sole determinavi, et qua utitur Acad. Parisin. in dicta *Connoissance*.

Diameter Lunæ micrometro =	11 142	hoc est	30' 57"
Hinc semidiameter Lunæ =	.	.	15 28½
Eadem, secundum Nicaſium Grammatici =	.	.	15 25½ Vide <i>Reſ's</i> } Tab. 12.
secundum J. Gauppium, . . .	.	.	15 21½ Astronom. } Tab. 13.
secundum calendarium Lipſienſe . . .	.	.	15 32

VIII. *Two Letters from the Rev. Henry Miles F. R. S. D. D. to Mr. Henry Baker F. R. S. concerning the Heat of the Weather in July and September last.*

I.

Dear Sir,

Read Nov. 22. 1750. I SEND you a brief Account of the State of the Weather, in this Place, on the 11th Instant, when the remarkable Storm happened; which, if you think fit, may be communicated to the *Royal Society*, when they meet; as there will probably be other Particulars relating to it sent in.

The Morning at 4 had nothing remarkable: At 2 *p. m.* the Heavens mostly clear, and no Indications of a Storm; the Barometer having fallen but $\frac{6}{180}$ Inch since 4 *a. m.* it then stood at 30, 20. the Thermometer at $87\frac{1}{2}$, and before 3 *p. m.* at $88\frac{1}{4}$, which is the hottest Temperature of the Air I ever knew.

At 4 *p. m.* we had very distant Thunder; soon after it came a little nearer, and was one continued Murmur, without any perceivable Intermission for great Part of an Hour: The Lightning accompanying it, not much. The Wind was nearly S. W. and dark Clouds passed by on each Side of us till they united in the N. forming one of the blackest Clouds I ever saw, over the City, as near as I could guess. We had not one Drop of Rain, nor did there fall either Rain or Hail for near 3 Miles to the N. of us towards *London*: A few Hail-stones, I am informed, fell in some Parts of *Clapham*; what the

D d d d

Extent

of the Storm might be on other Sides of the City I have not heard.

By the Observation I made, there did not appear any considerable Change in the State of the Air, as to the Weight or Heat of it. The Barometer fell little, and the Thermometer no more than usual at that time of the Evening. Mr. *Canton* writes me, that his Thermometer in *Spital Square* (of the same Construction with mine, and kept too in the open Air) fell no less than 17 Degrees. I am,

Tooting, July 18,
1750.

Dear Sir,

Your, and the Royal Society's,

most obedient, and

most humble Servant,

H. Miles.

II.

Tooting, September 2, 1750.

AT 4 a. m. the Wind being easterly, and blowing strong, accompanied with several short Showers of Rain, the Barometer being at 29.97, I observed my Thermometer abroad to stand at 61 : A Degree of Heat exceeding any I have taken notice of during the whole Summer at that time of the Morning.

H. Miles.

IX. *Extract of a Letter from Mr. William Arderon F. R. S. to Mr. H. Baker F. R. S. concerning the hot Weather in July last.*

Dear Sir,

Read Nov. 22.
1750.

THIS Letter waits upon you with my Observations on the late hot Weather; which, for 12 Days past, has been here at *Norwich* the most excessive I ever knew. The Beginning of this Heat was on the 8th of this instant *July*; on which (tho' the whole Day was cloudy) the Ground was so uncommonly hot, that I could not bear to walk on it long together without much Uneasiness; and many were sensible of the same Inconvenience as well as myself.

On *Wednesday* the 11th, which was the hottest Day of all, my Thermometer in the Sun's Rays stood 11 Degrees above the Heat of human Blood; and in the Shade, in my House, only 8 Degrees below it. The Distance between Freezing and the Heat of human Blood being divided into 100 Parts.

An Inch of Tallow, $\frac{6}{10}$ of an Inch in Diameter, liquefied in the Sun in less than 30 Minutes. A Piece of Resin, $\frac{1}{10}$ of an Inch in Diameter, became so soft as to be liable to take any Impression in the same time.

But, that you may form a better Judgment of the Heat at *Norwich*, on the said 11th Day of *July*, and for three Days before, and for 3 Days after, you will see below how *Hauksbee's* Thermometer stood at different Times in each of those Days.

July 8 { Morning 7 33
Evening 10 25

July 9 { Morning 7 26
Evening 2 15
Evening 10 18

July 10 { Morning 7 24
Evening 2 11
Evening 10 16

July 11 { Morning 7 19 *Reaum. Fabr.*
Evening 2 $8\frac{1}{2} = 1026 = 83$
Evening 10 16

July 12 { Morning 7 18
Evening 2 12
Evening 10 16

July 13 { Morning 7 18
Evening 2 12
Evening 10 16

July 14 { Morning 7 32
Evening 2 13
Evening 10 29

I observe 3 o' Clock in the Afternoon, when the Sky is clear, is the hottest Part of the Day; but Clouds mostly came on about that time on these Days.

Many People here, who judged by their outward Senses only, without paying any Regard to Thermometers,

mers, have thought the 11th of *June* 1748 was hotter: But I imagine the Reason to be, that the Heat this Year came on gradually from Day to Day; whereas in the Year 1748 it was much more sudden; the Thermometer then rising 22 Degrées more in one Day than the preceding; which, consequently, would make the Difference between one Day and another appear the more extraordinary. But, by my Observations on the 11th of *June* 1748, *Hauksbee's* Thermometer stood at $14\frac{1}{2}$; full 6 Degrees cooler than on the 11th of this present *July*. I am,

S I R,

Norwich, *July* 23.
1750.

Your most humble Servant,

William Arderon.

P. S. Several Horses have dropped down dead under their Masters, overcome by this violent Heat.

X. *A total Eclipse of the Moon, observed Dec. 2, 1750. in the Morning in the Strand, London, about 5" of Time West of St. Paul's, and 27" West of the Royal Observatory at Greenwich; by Dr. Bevis and Mr. James Short F. R. S.*

Read Dec. 13.
1750.

A SENSIBLE Penumbra h ' "
(Dec. 1.) at 16 32 0
The Eclipse judged to begin at : 36 50
Grimaldi

	h	'	"
<i>Grimaldi</i> covered	40	20
Shadow touches <i>Mare Humorum</i>	45	26
at the Middle of <i>Kepler</i>	48	40
at the Middle of <i>Aristarchus</i>	50	7
touches <i>Copernicus</i>	55	23
<i>Copernicus</i> half-cover'd	56	56
----- quite cover'd	58	5
<i>Timocharis</i> half-cover'd	59	0
Shadow touches <i>Tycho</i>	59	20
at the Middle of <i>Tycho</i>	17	0	0
covers <i>Tycho</i>	1	3
at the Middle of <i>Menelaus</i>	14	42
touches <i>Goclenius</i>	24	29
covers <i>Goclenius</i>	25	17
at the Middle of <i>Proclus</i>	27	20
touches <i>Mare Crisium</i>	28	44
at the Middle of <i>Mare Crisium</i>	31	15
covers <i>Mare Crisium</i>	33	30
Total Immersion at	36	5
The Moon begins to emerge	19	14	33
<i>Grimaldi</i> begins to emerge	16	4
quite uncover'd	18	10

The Moon was now got so low, and Day-light so far advanced, that no more Phases could be observed with any Degree of Certainty.

These Observations were made with a reflecting Telescope, that magnified 40 times, and a refracting Telescope, which magnified 12 times; and the Times were the same thro' these two Telescopes; for the Air was exceeding clear, and the Shadow well defined, the *Penumbra* being scarce sensible,

Here

Here follows a Computation, made from Dr. *Halley's* Tables, by Mr. *John Catlin*, of *Guy's* Hospital; and sent to Mr. *Short* the Day before the Eclipse.

<i>Dec. 1. in the Morning 1750.</i>			
Beginning of the Moon's Eclipse	. 16	44	31
Immersion at . . . . .	. 17	42	45
Emerfion at . . . . .	. 19	20	37
End at . . . . .	. 20	18	51

From hence it appears, that the Eclipse began about 8 Minutes fooner than the Computation from Dr. *Halley's* Tables gave it; but the Computation which Mr. *Brent* made and published fome time before the Eclipse happen'd, was within a Minute of the Time obferved; and this Exa^cinefs he imputes to his leaving out three of the feven Equations of the Moon, published by Sir *Isaac Newton* in his Theory of the Moon.

XI. *An Account of some Experiments, made by Benjamin Robins Esq; F. R. S. Mr. Samuel Da Costa, and several other Gentlemen, in order to discover the Height to which Rockets may be made to ascend, and to what Distance their Light may be seen; by Mr. John Ellicott F. R. S.*

Read Dec. 13. 1750. **S**OON after the Exhibition of the Fire-works * in the *Green Park*, Mr. *Robins* communicated to this *Society* an Account of the Height to which several of the Rockets there fired were observed to rise. In this Account, after having given a short Description of the Instrument with which the Heights were measured, he observes, that the customary Height to which the single or honorary Rockets, as they are stiled, ascended, was about 465 Yards; that three of them rose to about 550 Yards; and the greatest Height of any of those fired in the grand *Girandole* was about 600 Yards. He likewise further observed, that, supposing Rockets are made to ascend 600 Yards, or more than a Third of a Mile, it follows, that if their Light be sufficiently strong, and the Air not hazy, they may be seen in a level Country at above 50 Miles Distance; and that, from the Nature of the Composition, and the usual imperfect Manner of forming them, he was of Opinion that Rockets were capable of being greatly improved, and made to reach much greater Distances.

Mr.

* On Occasion of the late Peace,

Mr. *Robins* not having been able to obtain any certain Account to what Distance any of these Rockets were actually seen, and considering the great Use that might be made of Rockets in determining the Position of distant Places, and in giving Signals for naval and military Purposes, he resolv'd to order some Rockets to be fired at an appointed Time, and to desire some of his Friends to look out for them at several very distant Places.

The Places fix'd upon for this Purpose, were, *Godmarsham* in *Kent*, about 50 Miles distant from *London*; *Beacon Hill* on *Tiptery-Heath* in *Essex*. at about 40 Miles; and *Barkway*, on the Borders of *Hertfordshire*, about 38 Miles from *London*.

Mr. *Robins* accordingly order'd some Rockets to be made by a Person many Years employ'd in the Royal Laboratory at *Woolwich*; to which some Gentlemen, who had been inform'd of Mr. *Robins's* Intentions, added some others of their own making. The 27th of *September*, 1749. at 8 in the Evening, was the Time appointed for the firing of them; but, thro' the Negligence of the Engineer, they were not let off till above half an Hour after the Time agreed upon. There were in all a dozen Rockets fired from *London Field* at *Hackney*; and the Heights were measur'd by Mr. *Canton*, Mr. *Robins* being present, at the Distance of about 1200 Yards from the Post from whence the Rockets were fir'd. The greatest Part of them did not rise to above 400 Yards; one to about 500, and one to 600 Yards nearly.

By a Letter I receiv'd the next Day from the Rev. Dr. *Mason*, of *Trinity College, Cambridge*,
 E e e who

who had undertaken to look out for them from *Barkway* on the Borders of *Hertfordshire*, I was inform'd, that, having waited upon a Hill near the Town with some of his Friends till about half an Hour past the Time appointed, without perceiving any Rockets, as they were returning to the Town, some of the Company seeing thro' the Trees what they took to be a Rocket, they immediately hasten'd back out of the Cloles into the open Fields, and plainly saw 4 rise, turn, and spread: He judg'd they rose about one Degree above the Horizon, and that their Lights were strong enough to have been seen much farther.

From *Essex* I was inform'd, that the Persons on *Tiptery-Heath* saw 8 or 9 Rockets very distinctly, at about half an Hour past 8; and likewise greatly to the Eastward of these 5 or 6 more. The Gentlemen from *Godmarsham* in *Kent* having waited till above half an Hour past 8, without being able to discern any Rockets, they fired half a dozen; which, from the Bearings of the Places were most probably those seen to the Eastward by the Persons upon *Tiptery Heath*; and if the Situations, as laid down in the common Maps, are to be depended upon, at about 35 Miles Distance.

The Engineer being of Opinion that he could make some Rockets, of the same Size as the former, that should rise much higher, Mr. *Robins* order'd him to make half a dozen. These last were fired the 12th of *October* following, from the same Place, and in general they rose nearly to the same Heights with the foregoing; excepting one which was observed to rise 690 Yards. The Evening prov'd very
hazy,

hazy, which render'd it impossible for them to be seen to any considerable Distance.

It being observ'd in these Trials, that the largest of the Rockets, which were about 2 Inches and a half in Diameter, rose the highest, Mr. *Robins* intended to have made some more Experiments, in order to a farther Discovery what siz'd Rockets would rise highest: But his Engagements with the *East India* Company preventing him, Mr. *Samuel Da Costa* late of *Devonshire-Square*, a Gentleman of an extraordinary Genius in Mechanics, and indefatigable in the Application, Mr. *Banks*, a Gentleman who had for many Years practis'd making Rockets, and two other Persons, undertook the prosecuting these Enquiries; and having made several Experiments as well with regard to the Composition, 'as the Length which Rockets might be made to bear, in proportion to their Diameters, and of different-siz'd Rockets, from 1 Inch and a half to 4 Inches Diameter, they intended this Winter to have made Trial of some of a yet greater Diameter, had not the Death of Mr. *Da Costa* prevented it.

I shall therefore beg Leave to give some Account of the Success which has hitherto attended their Undertaking, so far as they went: And as it has been much beyond what was expected, I am in hopes this short Relation will not prove unacceptable.

Amongst some Rockets fired in the last Spring, there were two made by Mr. *Da Costa* of about 3 Inches and a half Diameter, which were observed to rise, the one to about 833, the other to 915 Yards. At a second Trial, made some time after,

there was one made by Mr. *Da Costa*, of 4 Inches Diameter, which rose to 1190 Yards. The last Trial was made the latter End of *April* 1750, where 28 Rockets were fired in all, made by different Persons, and of different Sizes, from 1 Inch and a half Diameter to 4 Inches; the most remarkable of each Size were as follows; one of 1 Inch and a half rose to 743 Yards; one of 2 Inches to 659; one of 2 Inches and a half to 880; another of the same Size, which rose to 1071; one of 3 Inches to 1254; one of 3 Inches and a half to 1109; and one of 4 Inches; which, after having rose to near 700 Yards, turned, and fell very near the Ground before it went out. These were all made by Mr. *Da Costa*. Besides these, there was one of the Rockets of $2\frac{1}{2}$ Inches in Diameter, which rose to 784 Yards, and another made by Mr. *Banks* of the same Size to 833.

As the making of large Rockets is not only very expensive, but likewise more uncertain than those of a lesser Size, so from the last Experiments it is evident, that Rockets from 2 Inches and a half to $3\frac{1}{2}$ Inches Diameter, are sufficient to answer all the Purposes they are intended for; and I doubt not may be made to rise to an Height, and to afford a Light capable of being seen to considerably greater Distances than those before-mention'd.

Before I conclude this Account, it may not be improper to take notice, that, tho' the Heights of the Rockets are set down to a single Yard, it is not pretended the Method made use of (tho' sufficient for all the Purposes of these Experiments) is capable of determining the Heights to so great an Exactness:

actness; for, as they were measur'd by only one Observer, it is evident, that, in any of the Rockets deviated from the Perpendicular, so as either to incline towards the Place of Observation, or to decline from it, the Height would be given either greater or less than the Truth; but as the Base upon which they were measur'd was 1190 Yards, the greatest Error that can arise on this Account will be but very inconsiderable. If we should suppose there might be an Error of 30 or even 50 Yards, which is very highly improbable, it must then be allowed, that several of these Rockets rose to 1000 Yards, one to 1100, and another to 1200 Yards, or double to any of those fired in the *Green Park*.

I have been informed, that the Relation of this Affair has appeared so very extraordinary to some Gentlemen conversant in such Matters, that they have mention'd it as their Opinion, that there must certainly have been some Mistake, either in placing the Instrument, taking the Heights, or otherwise. In answer to which I would observe, that, in all the Experiments mentioned in this Paper, the Heights were all taken by the same Person, *viz.* Mr. *John Canton*, and that the last Trial was made in the Presence of several very worthy Members of this *Society*. That the Instrument, being first fixed to a proper Angle was not alter'd during the whole Time of Trial; and therefore, if there had been any Mistake in fixing it, that Mistake would have varied the Height of all the Rockets as much as those of Mr. *Da Costa's*; but it was those of Mr. *Da Costa's* only, and that at three different Trials, which rose to such extraordinary Heights;
and

and therefore I think we have sufficient Reason to conclude that their Measures were certainly taken very near the Truth.

John Ellicott.

XII. *Several Papers concerning a new Semi-Metal, called Platina; communicated to the Royal Society by Mr. Wm. Watson F. R. S.*

I.

Extract of a Letter from William Brownrigg M. D. F. R. S. to Wm. Watson F. R. S.

Dear Sir, *Whitehaven, Dec. 5, 1750.*

Read Dec. 13. 1750. I TAKE the Freedom to inclose to you an Account of a Semi-metal call'd *Platina di Pinto*; which, so far as I know, hath not been taken notice of by any Writer on Minerals. Mr. *Hill*, who is one of the most modern, makes no mention of it. Presuming therefore that the Subject is new, I request the Favour of you to lay this Account before the *Royal Society*, to be by them read and published, if they think it deserving those Honours. I should sooner have published this Account, but waited, in hopes of finding Leisure to make further Experiments on this Body with sulphureous and other Cements; also with Mercury, and several corrosive *Menstrua*. But these Experiments I shall now defer, until I learn how the above is receiv'd. The Experiments which I have related were several of them made by a Friend, whose Ex-

actness in performing them, and Veracity in relating them, I can rely on: However, for greater Certainty, I shall myself repeat them I am, dear Sir,

Your most obedient Servant,

W. Brownrigg.

II.

Memoirs of a Semi-metal called Platina di Pinto, found in the Spanish West Indies.

ALTHO' the History of Minerals, and other fossil Substances, hath been diligently cultivated, especially by the Moderns; yet it must be acknowledged, that, among the vast Variety of Bodies which are the Objects of that Science, there still remains Room for new Inquiries.

No Wonder that, among the great, and almost inexhaustible Varieties of Salts, Ores, and other Concretes, new Appearances, and Mixtures before unknown, should daily be discover'd: But that, among Bodies of a more simple Nature, and particularly among the metalline Tribe, several distinct Species should still remain almost wholly unknown to Naturalists, will doubtless appear more strange and extraordinary.

Gold is usually esteem'd the most ponderous of Bodies; and yet I have seen, in the Possession of the late Professor *s'Gravesande*, a metalline Substance, brought from the *East Indies*, that was specifically heavier than Gold, by at least a twentieth Part. Mercury, next to Gold, is commonly said to be the heaviest Body; yet Mercury is greatly exceeded in specific Gravity
by

by a Semi-metal brought from the *West Indies*, whereof I have now the Honour to present Specimens to the *Royal Society*. And this Semi-metal seems more particularly to deserve our Attention, as it is endu'd with some very singular Qualities, which plainly demonstrate that certain general Theorems, tho' long establish'd, and universally receiv'd by the Metallurgists, yet do not hold true in all Cases, and ought not to be admitted into their Arts, without proper Limitations and Restrictions. For instance, *That Gold and Silver may be purified from all heterogeneous Substances by Coppellation*, is a Proposition that all Assayers and Refiners have long thought true and undeniable; yet this Proposition ought not to be receiv'd by those Artificers, without an Exception to the Semi-metal here treated of; since, like those nobler Metals, it resists the Power of Fire, and the destructive Force of Lead in that Operation.

This Semi-metal was first presented to me about nine Years ago, by Mr. *Charles Wood*, a skilful and inquisitive Metallurgist, who met with it in *Jamaica*, whither it had been brought from *Carthagera* in *New Spain*. And the same Gentleman hath since gratified my Curiosity, by making further Inquiries concerning this Body. It is found in considerable Quantities in the *Spanish West Indies* (in what Part I could not learn) and is there known by the Name of *Platina di Pinto*. The *Spaniards* probably call it *Platina*, from the Resemblance in Colour that it bears to Silver. It is bright and shining, and of a uniform Texture; it takes a fine Polish, and is not subject to tarnish or rust; it is extremely hard and compact; but, like Bath-metal, or cast Iron, brittle, and cannot be extended under the Hammer.

The

The *Spaniards* do not dig it in the Form of Ore, but find it in Dust, or small Grains, as herewith presented to the *Royal Society*. Whether they gather it in a pretty pure State, as brought to us, or wash it, like Gold-dust, from among Sand, and other lighter Substances, is to me unknown: However, it is seldom collected perfectly pure; since, among several Parcels of it that I have seen, I constantly observ'd a large Mixture of a shining black Sand, such as is found on the Shores of *Virginia* and *Jamaica*, which is a rich iron Ore, and answers to the Magnet. It hath also usually mix'd with it some few shining Particles of a golden Colour, which seem to be a Substance of a different Nature.

It is very probable that there is great Plenty of this Semi-metal in the *Spanish West Indies*; since Trinkets made of it are there very common. A Gentleman of *Jamaica* bought five Pounds of it at *Carthagena* for less than its Weight of Silver; and it was formerly sold for a much lower Price.

When expos'd by itself to the Fire, either in Grains, or in larger Pieces, it is of extreme difficult Fusion; and hath been kept for two Hours in an Air Furnace, in a Heat that would run down cast Iron in fifteen Minutes: Which great Heat it endur'd without being melted or wasted; neither could it be brought to fuse in this Heat, by adding to it Borax, and other saline Fluxes. But the *Spaniards* have a Way of melting it down, either alone, or by means of some Flux; and cast it into Sword-hilts, Buckles, Snuff-boxes, and other Utensils.

When expos'd to a proper Degree of Fire, with Lead, Silver, Gold, Copper, or Tin, it readily melts
F f f f and

and incorporates with these Metals; rendering the Mixture, like itself, extremely hard and brittle.

Having been melted in an Assay-Furnace, on a Test with Lead, and therewith exposed to a great Fire for three Hours, till all the Lead was wrought off, the *Platina* was afterwards found remaining at the Bottom of the Test, without having suffer'd any Alteration or Diminution by this Operation.

A Piece of *Platina* was put into strong and pure *Aqua fortis*, and therewith placed in a Sand-heat for twelve Hours: The *Platina*, when taken out of the *Aqua fortis*, was found of the same Weight as when put into it; being in no-wise dissolved or corroded by that *Menstruum*.

It had been reported, that this Semi-metal was specifically heavier than Gold; but having weigh'd several Pieces of it hydrostatically in a nice Assay-Balance, I found one of these Pieces to weigh in Air $gr. \frac{341}{8}$, and in Water $gr. \frac{22}{8}$: So that its specific Gravity was to that of Water exactly as 15 : 1. Another Piece, that seem'd to be cast very open and porous, I found in Gravity to Water only as 13.91 to 1. Altho' this last-mention'd Piece, could it have endur'd the Hammer as well as Gold, might probably have been reduc'd to a considerably greater Degree of Solidity than that of the first-mention'd Specimen. For the purest Gold is seldom found, after Fusion, to come up to its true specific Weight, until it hath been brought up to its greatest Degree of Solidity under the Hammer.

I also weigh'd an equal Mixture of Gold and *Platina*, which I found nearly as ponderous as Gold itself; the specific Weight of this Mixture being to that of Water as 19 to 1.

It hath been reported, that the *Spaniards* have sometimes been tempted to adulterate Gold with *Platina*, as the Mixture could not be distinguish'd from true Gold by all the ordinary Trials: But the Gold thus adulterated was, upon a nicer Examination, found hard and brittle, and could not be separated from the *Platina*, and render'd ductile and pure, either by Cementation, or by the more ordinary Operations with Lead and Antimony. In order therefore to prevent this Fraud, the King of *Spain* commanded that the Mines of *Platina* should be stopped up; so that this Semi-metal is now much scarcer than formerly.

From the foregoing Account it appears, that no known Body approaches nearer to the Nature of Gold, in its most essential Properties of Fixedness and Solidity, than the Semi-metal here treated of; and that it also bears a great Resemblance to Gold in other Particulars. Some Alchemists have thought that Gold differ'd from other Metals in nothing so much as in its specific Gravity; and that, if they could obtain a Body that had the specific Weight of Gold, they could easily give it all the other Qualities of that Metal. Let them try their Art on this Body; which, if it can be made as ductile as Gold, will not easily be distinguish'd from Gold itself.

Upon the whole, this Semi-metal seems a very singular Body, that merits an exacter Inquiry into its Nature than hath hitherto been made; since it is not altogether improbable, that, like the Magnet, Iron, Antimony, Mercury, and other metallic Substances, it may be endowed with some peculiar Qua-

lities, that may render it of singular Use and Importance to Mankind.

Specimens of Platina presented to the Royal Society.

- N^o. 1. *Platina*, in Dust, or minute Masses, mixed with black Sand, and other Impurities, as brought from the *Spanish West Indies*.
2. Native *Platina*, separated from the above-mention'd Impurities.
3. *Platina* that has been fused.
4. Another Piece of *Platina*, that was Part of the Pummel of a Sword.

III.

To the Royal Society.

Gentlemen,

London, Dec. 13, 1750.

I BEG Leave to subjoin a few Lines to my learned and ingenious Friend Dr. *Brownrigg's* Paper concerning the *Platina di Pinto*, or what is likewise call'd in *America Juan Blanco*. This Substance is mention'd in no Author I have met with, except by our worthy Brother Don *Antonio d'Ulloa*, who, in the History of his Voyage to *South America*, Vol. II. Book 6. Chap. 10. which I have here extracted, and translated from the *Spanish*, when giving an Account of the Gold and Silver Mines in the Province of *Quito*, and of the various Methods of separating these Metals from other Substances, with which they are combin'd, says, that, "in the Territory of "*Choco* . . . there are Gold Mines, in which that
" Metal

“ Metal is so disguised and enveloped with other
 “ mineral Substances, Juices, and Stones, that, for
 “ their Separation from the Gold, they are oblig’d
 “ to use Quicksilver. Sometimes they find mineral
 “ Substances, which, from their being mixed with
 “ *Platina*, they chuse to neglect. This *Platina*
 “ is a Stone (*Piedra*) of such Resistance, that it
 “ is not easily broken by a Blow upon an Anvil.
 “ It is not subdued by Calcination; and it is very
 “ difficult to extract the Metal it contains even with
 “ much Labour and Expence.”

In the before mention’d Work, *Chap. II.* the same
 Author, when speaking of the remaining Works of
 the *Indians* of old, says, “ the *Specula* wrought
 “ out of Stones, which are found in the Places of
 “ Worship of the *Indians*, are of two kinds, in re-
 “ lation to the Matter of which they are made:
 “ One of these is call’d *Piedra de Inga*, the other
 “ *Piedra de Gallinazo*. The first of these is smooth,
 “ of a leaden Colour, and not transparent; they are
 “ usually found wrought of a circular Figure: One
 “ of the Surfaces is plain, and as smooth as though
 “ it were made of a kind of Chrystal; the other Sur-
 “ face is oval, or rather somewhat spherical, and not
 “ so much burnish’d as the plain one. Although they
 “ vary in their Size, they are commonly from three
 “ to four Inches in Diameter; but he has seen one
 “ that was a Foot and half in Diameter. Its prin-
 “ cipal Surface was concave, and much augmented
 “ the Size of Objects, as its Polish was in as great
 “ Perfection as though it had been work’d by a dex-
 “ trous Artist in these Times.

“ This

“ This Stone has certain Veins, or hair-like Appearances, on its Surface; whereby it is render’d less fit for a *Speculum*, and is apt to break in these Veins in receiving any Blow. Many are persuaded, or at least suspect, that the Matter of these is a cast Composition; and although there are some Appearances of this being so, they are not sufficiently convincing. In this Country there are Gulches (*Quebradas*) where the Mineral of them is found rough, and from whence some are always taken; but these are not now wrought for those Purposes for which heretofore they were employ’d by the *Indians*: But this is no Reason but that some of them may have been cast, as with the same Material taken out of the Mine, they may have been made artificially, and thereby have receiv’d a greater Degree of Perfection, as well in their Quality as in their Figure.” He says further, “ that, although at present, these, as well as several other things found there are but of small Value, nevertheless they are extremely curious, and worthy to be esteem’d, as well for their great Antiquity, as for their being the Performances of those barbarous People.”

Some of these *Piedras de Inga* I now take the Liberty of laying before the *Society*, both in their rough and in their polish’d State. They were brought hither with several other Curiosities from *America*, by that excellent Person, and my much-lamented Friend, Don *Pedro Maldonado*, and were presented by him to our most worthy *President*, who was pleas’d to put them into my Hands. They are doubtless of a metalline Substance, and have, in
 my

my Opinion, evident Marks of having been fused and cast. They very much resemble, as you will see by comparing them, the *Platina* before-mention'd : And though they are call'd (*Piedras*) Stones by Don *Antonio d'Ulloa*, he likewise gives the same Appellation to the *Platina*. I cannot therefore help recommending to some curious Metallurgist of the *Society* to make the Experiment, whether or no, when the *Piedras de Inga* are, by a proper Process, divested of their stony and other heterogeneous Parts, the metalline *Residuum* will not resemble, as well in specific Gravity (for which it is so remarkable) as in other Properties, the purified *Platina* now before us ?

Wm. Watson.

IV.

Read Dec. 20. 1750. **I**N *January* 1742-3. there were brought from *Jamaica*, in a Man of War, several Bars (as thought) of Gold, consigned from different Merchants of that Island, to their different Correspondents here, as Bars of Gold. These Bars had the same specific Gravity, or rather more than Gold, and were exactly like that Metal in Colour, Grain, &c. A Piece of one of these counterfeit Bars was sent to the Mint to be tested, and it was found to be twenty-one Carats three Grains worse than Standard.

Emanuel Mendez da Costa.

*Extract of a Letter from Wm. Brownrigg M. D.
and F. R. S. to Wm. Watson F. R. S. contain-
ing some further Experiments upon the Platina.*

Whitehaven, Feb. 13, 1750.

Read Feb. 28. ^{1750-51.} I WAS favour'd with your Letter of Dec. 15, and am much obliged to you for the Trouble you took in presenting my Specimens of the *Platina* to the *Royal Society*, together with my Memoir relating thereto; and I thank you for the Addition you made to it of the Extract of Don d'Ulloa's Voyage.

The Gentleman, whose Experiments on *Platina* I mention'd to the *Royal Society*, was Mr. Charles Wood, who permitted me to make what Use of them I pleas'd; and I did not pretend to have made any new Discovery, nor to know so much of that Body, as hath long been known to the *Spaniards*. I might indeed have made use of his Authority; but he was not ambitious of appearing in Print.

The chief thing about which I had any Difficulty, was what had been asserted of the *Platina's* resisting the Force of Lead in Coppellation. This Experiment I have tried therefore, by adding to gr. xxvi. of *Platina*, sixteen times its Weight of pure Lead, that I had myself reduced from Litharge. To the Lead put into a Coppel, and placed in a proper Furnace; as soon as it was melted I added the *Platina*, which in a short time was dissolved in the Lead. After the Lead was all wrought off, there remain'd at the Bottom of the Coppel a Pellet of *Platina*, which I found to weigh only gr. xxi.; so that, in
this

this Operation, the *Platina* had lost near a fifth Part of its Weight.

According therefore to this Experiment, the *Platina* does not wholly resist the Force of Lead in Coppellation ; but, by repeated Operations of that kind with larger Quantities of Lead, may probably all be destroy'd: And by such repeated Coppellations, Gold and Silver may very likely be refin'd from it ; although what was before asserted may hold pretty true, with regard to the common Coppellations of the Assayers and Refiners.

Mr. *Wood* said, that, in his Experiment, he thought the *Platina* rather gain'd than lost in Weight by Coppellation. This might happen from some small Mixture of Lead, or other Metal continuing with it after it remained no longer fused.

From this single Experiment I will not be quite positive that Lead thus consumes some small Quantity of *Platina*, since it is possible the *Platina* used might not be pure. Besides, in order to keep it longer in Fusion, I urged on the Experiment with an uncommon Degree of Heat, especially towards the End of the Operation ; although I think no great Error could thence arise ; as half a Drachm of Silver, which I coppell'd at the same time, had lost only two Grains in the Operation.

I am told that one Mr. *Ord*, formerly a Factor to the *South Sea Company*, took in Payment from some *Spaniards* Gold, to the Value of 500 *l.* Sterling, which being mix'd with *Platina*, was so brittle, that he could not dispose of it, neither could he get it refin'd in *London*, so that it was quite useless to him: Altho', if no Error hath been committed

mitted in the above-mention'd Experiments, it might probably have been render'd pure by a much larger Dose of Lead than is usually applied for that Purpose.

To my Memoir I might have added, that, attempting to cleanse a Parcel of the native *Platina* from the black Sand, wherewith it was mixed, I found that a great many of its Grains were attracted by the Magnet I made use of for that Purpose. This Circumstance I took notice of in a Letter to Lord *Lonsdale* two Years ago. I am,

Dear Sir,

Your most obliged humble Servant,

W. Brownrigg.

XIII. *An Account of a very large human Calculus, by Wm. Heberden M. D. F. R. S. and Fellow of the Coll. of Physic. Lond.*

Read Dec. 20. 1750. **T**HERE is preserved in the Library of *Trinity-College* in *Cambridge*, a Stone taken from a human Bladder, which, for its uncommon Size, may deserve the Notice of his *Society*. It is of an oval Shape, flatted on one Side and its Surface is smooth. The specific Gravity plainly shews, that it is of an animal Origin; for its Weight is to that of Water only as 1,75 to 1.

In order to get a true and well-attested History of this curious Stone, the Right Rev. Dr. *Claggett*, late Bishop of *Exeter*, was applied to, who was
Keeper

Keeper of the Library at the time when it was given, and likewise the Rev. Dr. *Baker*, who was then a Fellow of *Trinity College*, and entertain'd the Gentleman that brought it; and lastly, a Son in law of the very Person from whom it was taken. From their Accounts it appear'd, that this Stone was taken from the Wife of *Thomas Raisin*, Locksmith in *Bury*, after her Death, by Mr. *Gutteridge*, a Surgeon, of *Norwich*.

She had felt much less Pain than might have been expected from so large a Stone; and might probably have liv'd much longer with it, if she had not thought herself well enough to attempt a Journey on Horseback; for, while she was riding, she was suddenly seized with violent Pains, that obliged her to be taken off the Horse immediately: After which she could never make Water, unless the Stone was first moved, and she continued in great Agonies till she died.

This happen'd in the Reign of King *Charles II.* who being then at *Newmarket*, had the Stone brought to him; some Part of which was chipp'd off from one of its Ends, to shew the King that it consisted of various Coats formed one over another, as animal Stones usually do.

Mr. *Samuel Battely*, who was Member of Parliament for *Bury*, had Possession of this Stone, either immediately, or very soon after the Woman's Death, and kept it till it was presented to *Trinity-College*. which was about the Middle of Queen *Anne's* Reign, This monstrous Stone weighs 33 Ounces 3 Drachms and 36 Grains, *Troy* Weight. There appears to have been at least half an Ounce broken off, on the Oc-

caſion before related; not to mention what it muſt have loſt by mere Wear in fourſcore Years.

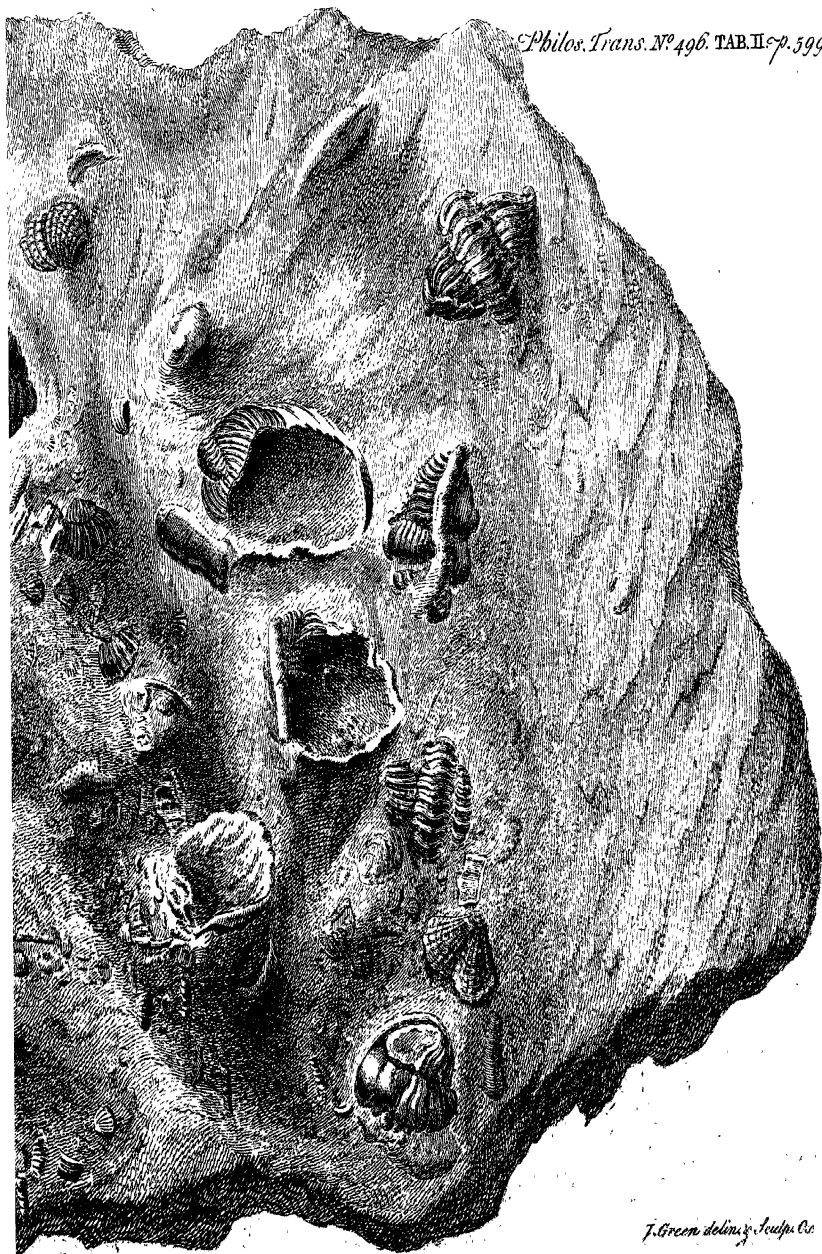
We are told, that they have in the Hoſpitals of *Paris* human *Calculi* weighing 34 *Paris* Ounces: But this in *Trinity* Library, even at preſent, weighs 34 *Paris* Ounces all but 9 Grains; and muſt have weigh'd conſiderably more when it was whole. Yet theſe are perhaps the heavielt that are any-where recorded; except that very extraordinary one mention'd by Dr. *Liſter*, in his *Journey to Paris*, p. 232; which he ſays was taken from a Monk *A. D.* 1690. and weighs 51 Ounces.

This Hiſtory may confirm to us the Uſefulneſs of endeavouring to relieve the Violence of Pain in this Diſtemper, by altering the Poſition of the Stone in the Bladder, either with the Help of the *Catheter*, or by ſome proper Alteration in the Poſture of the Patient; ſince, with reſpect to the Pain which it occaſions, the Situation of the Stone appears to be of far greater Conſequence than its Size.

XIV. *A Letter from the Rev. Charles Lyttelton LL.D. and F. R. S. Dean of Exeter to the Preſident, concerning a non-deſcript petrified Inſect.*

Read Dec. 20, 1750. **T**HE curious Fossil I have now the Honour to exhibit to the *Society*, is as rare as its Figure is elegant; having been mention'd by none of our own Writers who treat on Fossils,





Fossils, and but very imperfectly describ'd by foreign Lithographists *.

I discover'd a single Specimen of it (*see* TAB. I. *Fig.* 3, 4, and 5.) last Year in the Limestone Pits at *Dudley* in *Worcestershire*; and very lately a large Mass of Limestone (*see* TAB. II.) full of them in the same Place; both which are now submitted to the Inspection of this Learned Body, who are best able to determine to what Class of the Animal Kingdom it properly belongs. I am, Sir, with great Regard,

Hill-street, Dec. 20.
1750.

Your most obedient Servant,

C. Lyttelton.

* I suppose the *Dean* means Dr. *Bruckmann*, and the late Mr. *Linck*, an eminent Apothecary at *Lipsick*: For Dr. *Bruckmann*, in his *Centuria Epist. Itinerar. Wolfenbuttl.* 1742. 4^o, *Epist.* XXIII has given several Figures of Petrefactions, very much resembling these *Dudley* Fossils; the first was found at *Steme*, a Village in the Neighbourhood of *Paderborn*, given him by Dr. *Kaenig*, which he took for a sort of *Polypus marinus*; he says it is an Animal unknown to him, but he gives those Figures of it, in hopes that some curious Persons, who live near the Sea, may light upon some Animal resembling this. The Body of this Stone, he says, has, on each Side three striated Lobes, and three pointed *Appendices* beneath; its inner Substance is white, being *Selenites*, or white Spar; its Colour on the Outside is every-where brown. His Friend *Linck* had sent him Specimens of these Stones 6 Years before, some modell'd in Wax, others engraved upon Copper.

G. M.

ADDENDA to the preceding Paper.

Extract of a Letter from the Rev. Dr. Lyttelton to C. Mortimer, Secret. R. S.

THE Rev. Dr. *Shaw*, of *Oxford*, has procured a Specimen of the extended *Eruca*. As the Fossilists differ'd in their Opinion of this *Dudley* Fossil, some pronouncing it an *Eruca*, others a *Bivalve*, I thought it best to leave the Reader to judge for himself from the Engravings; but, as we are now able to add a Specimen of this Fossil in an extended Posture, there is a better Pretence to call it an *Eruca*. See TAB. I. Fig. 6. 7. and 8.

XV. *Some further Account of the before-mention'd Dudley Fossil, by the Editor of these Transactions.*

THE Rev. Dr. *Pocock*, F. R. S. was so obliging as to send several Specimens of this Fossil to the *President*; who put them into my Hands, and desired me to draw up an Account of them to be annexed to the preceding Paper.

The first Specimen is a Mass of Stone containing the Face and Eyes, with some Rudiments of Legs on the Sides; but the Back is intirely broken away. Another Specimen contains the Head only: A third, the Head, and Part of the Back, but greatly distorted. But the most beautiful and complete are the two
which

which I caused to be drawn and engraven in TAB. I. at *Fig. 9, 10, 11, 12.*

At *Fig. 9.* is one of these Insects completely extended at its whole Length; wherein it appears, that the Head is cover'd with a Shell or Crust consisting of three Parts; the middle Part is broad and round, *a.* which I shall therefore call the Nose: The two side Pieces are of a triangular Form, *b. b.* in each of which is situate a large protuberant Eye, *c. c.* The anterior Part of the Whole is encompassed by a round Border, *d. d. d.* which looks like an upper Lip; tho' I do not take it to be so; but that the Mouth is situate lower down, as in the Crab-kind, and does not appear in any of the Specimens I have yet seen. On each Side the Crown of the Head, towards the back Part of it, are two small Knobs, *e. e.* At *f. f.* in *Fig. 10.* appear some Traces of Feet, which seem to lie under the Belly: But, as the Belly, or under Side, was not distinct, not being cleared from its stony and earthy Matter, I could not discern any other Legs.

It is most likely the whole Back of this Creature was, when alive, cover'd with a Case, or undivided *Elytrum*, as is the *Scolopendra aquatica scutata*, described in these *Transactions*, n. 447. p. 150, and 153. by M. Klein, of Dantzick; and afterwards by the Rev. Mr. *Littleton Brown*, both worthy Members of this *Society*. M. Klein says, the Case was whole; and that he was forced to slit it open to shew the Back underneath; when it appears, that the Body was trilobated, as in *Fig. 9.* The Case, being very thin and tender, may probably have been broken

ken off at the Death of the Animal, before its being petrified.

Mr. *Brown* does not mention in his Insect the Property of rolling itself up, which this certainly had; as appears by several of the Figures, as *Fig. 3, 4, 5, 7, 11, and 12*, which are intirely rolled up; and as is more particularly represented by *Fig 11 and 12.* in which it appears, that the Tail is turn'd up under the Belly quite to the Mouth; and at *Fig. 8.* the Creature seems but half-rolled up.

I have consulted all the Books I could meet with, which give Figures of Insects and crustaceous Animals in their natural and petrified States; and find none resemble this *Dudley* Fossil so near as M. *Klem's* Insect; therefore I shall, till we get more Information, call it, *Scolopendræ aquaticæ scutatæ affine animal petrifactum.*

XVI. The Description and Figures of a small flat spheroidal Stone, having Lines formed upon it; by C. Mortimer, M. D. & Secret. R. S.

MR. *Peter Collinson*, a very worthy Member of the *Royal Society*, produced, at a Meeting of that Body, on *Nov. 8. 1750.* a very curious spheroidal Stone, about 4 Inches Diameter, of a Chocolate-colour, marked with 4 white Lines, about the Breadth of a Horse-hair, encompassing the whole Stone, like the Meridians on a Globe; but, instead of crossing one another in a Point, as *they* do, upon the Globe, these are connected by a short transverse Line; as is described above in *p. 535* of this

this *Transaction*, and as may be distinctly seen in TAB. I. *Fig.* 1. at *CD*.

I lately received, by a Friend, from the Isle of *Shepey* in *Kent*, a small Stone, with similar Lines upon it. Mine is only $\frac{7}{8}$ of an Inch in Diameter, of a brown Colour, and of the Consistence of Marble. As a Description in Words does not convey so clear an Idea as an exact Drawing, I have endeavoured to give Representations of this Stone in different Views; as at TAB. I. *Fig.* 13, 14, 15, 16.

Fig. 13. represents the Top of the Stone, on which the Lines are most regular, being depressed into the Stone, and of the same Colour with it. *a, c, d, e*, are the four principal Lines, answering to those on Mr. *Collinson's* Stone, and are connected, as in his, by the transverse Line *gh*. The Line *b* is an Irregularity in this Stone, and so is *f*, which are not in the other; these irregular, or supernumerary Lines being continued to the other Hemisphere,

Fig. 14. or Bottom of the Stone, make the Directions of the other Lines very irregular, as may be seen in the Figure; only the Lines *c, d*, and *e*, being connected by the transverse Line *gh*, which here stands at right Angles with that in *Fig.* 13.

The following Figures represent the Section of the Stone thro' its Equator, as nearly as possible; only the Mill cut away the Substance to about the Thickness of a Shilling. In these Sections the Ramifications appear quite white.

Fig. 15. shews the Section of the upper Hemisphere, as

Fig. 16. does that of the lower Hemisphere; in both of which the Letters of Reference answer to those in the other Figures, shewing where the outside Lines abutt upon these Sections.

An Explanation of the Figures in TAB. I.

1. Mr. *Collinson's* spheroidal Stone.
2. The Section of the same.
3. The Face of the *Dudley* Fossil rolled up.
4. The Back of the same.
5. The fore and under Part, with the Tail folded close under the Jaw.
6. Dr. *Skaw's* Fossil half extended.
7. The Face of the same.
8. The under Side of the same, being folded but half-way, leaving a Space between the Jaw and the Tail.
9. Dr. *Pocock's* extended Fossil, the Back uppermost.
10. A side View of the same.
11. A side View of another folded up.
12. A front View of the same with the Tail folded close under the Jaw.

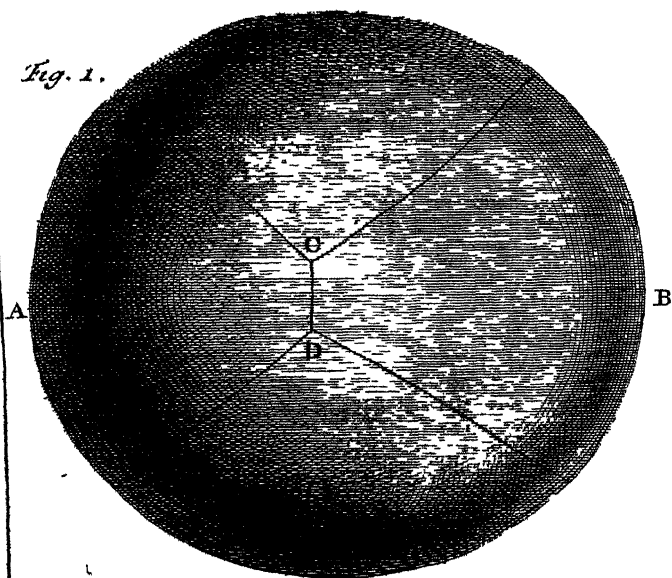
The Letters of Reference in the Description answer to the same Parts in *Fig. 9, 10, 11, and 12.*

13, 14, 15, 16, are the Figures of the Stone, described in *Art. XVI.* in all which the Letters refer to the same Lines.

TAB. II. Represents a large Mass of Lime-stone dug up at *Dudley*, in which are imbodied many of these Fossils, together with several other petrified Shells.

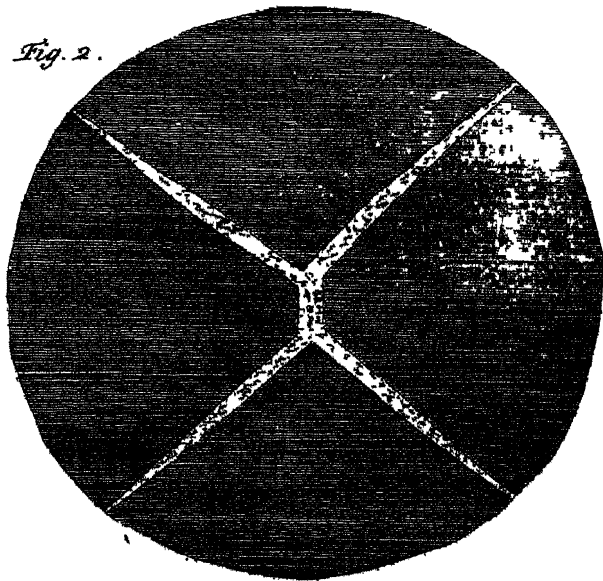
NOTE.

Fig. 1.



p. 535.

Fig. 2.

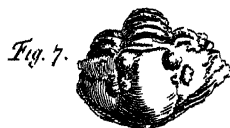




p. 603.



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p. 599.

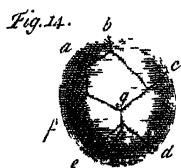
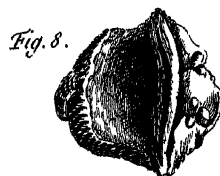
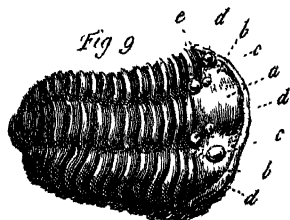
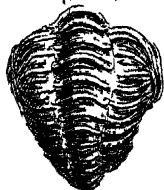
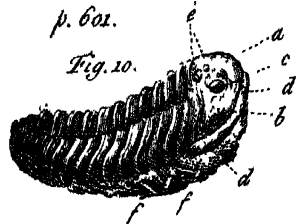


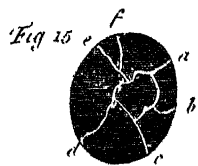
Fig. 4.



p. 601.



p. 601.



p. 604.



p. 599.

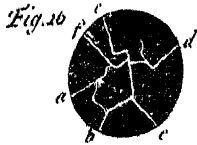


Fig. 6.



Fig. 12.



J. Mynde sc.

NOTE.

To N. 491, p. 64, l. 1. *hence we are led to a Discovery, &c.* add this Note, *The Discovery of this Analogy was published by the Rev. Mr. William Barlow, in these Transactions, N. 458, p. 457, Anno 1740.* C. M.

ERRATA.

In N^o. 495. p. 514, l. 2. for *with* read *within*. Ibid. p. 515, l. 24. for *Nomius* read *Catgut Line*.

A N
I N D E X
T O T H E
Forty-sixth VOLUME
O F T H E
Philosophical Transactions,
For the Y E A R S 1749, and 1750.

A.

Abstracts of several Observations of *Auroræ Boreales*,
n. 495, *p.* 499—505.

Acceleration of the Moon, by Rev. Mr. Richard Dun-
thorne, *n.* 492, *p.* 162.

Adee, M. D. (*Swetkin*) on the Virtues of *Jessop's Well*
Waters, *n.* 495, *p.* 451.

Agreement of Thermometers, in *London*, and at *Tooting*,
n. 493, *p.* 208.

Air, Obs. of the Change of its Temperature, *Nov.* 22.
1748. by Dr. *Miles*, *n.* 491, *p.* 3.

Ammonitæ, or *Cornua Ammonis*, some *Vertebrae*, by the
same, *n.* 491, *p.* 37.

Amphora, the *Roman*, *n.* 491, *p.* 70.

Ansell, an antient Weight, *n.* 491, *p.* 55.

Apotheosis, or *Beatification*, an Electrical Experiment, by
Prof. *Bose*, *n.* 494, *p.* 350.

Apple-trees, the Effects of the Mixture of their *Farina*,
n. 493, *p.* 206.

I N D E X.

- Approach*, the gradual, of the *Earth* to the *Sun*, *n.* 493,
p. 204.
Arch, a luminous, *Febr.* 16, 1749. by Dr. *Wm. Cooper*,
n. 497, *p.* 647.
Ardron (Mr. *Wm.*) of the *Roman Camp* at *Castor* in
Norfolk, *n.* 493, *p.* 196.
 ——— Account of a Dwarf, *n.* 495, *p.* 467.
 ——— of the hot Weather in *July* 1750, *n.* 496, *p.* 573.
 ——— of an *Explosion* in the Air, heard at *Norwich*, *June*
 7. 1750, *n.* 497, *p.* 698.
Arithmetical Instrument, the *Skwan-pan*, by Mr. *Sme-*
thurst, *n.* 491, *p.* 22.
Arm, an extraordinary Case of the *Fracture* of one, by
 Mr. *Freke*, *n.* 494, *p.* 398.
Avoirdupois, the legal and antient Standard Weight, *n.*
 491, *p.* 54. 59.
 ——— the Ounce the same as the *Roman*, *ibid.* *p.* 69.
 Whence its Name, *ib.* *p.* 68.
Aurora Australis, seen at *Chelsea*, *Jan.* 23, 1749-50, by
John Martyn, *n.* 494, *p.* 319. — *Feb.* 16, *ib.* *p.* 345. by
 the same. — *Jan.* 23, 1750-51, by Dr. *Henry Miles*,
ib. *p.* 346.
 ——— *Borealis* at *Northampton*, obs. by Dr. *Doddridge*,
n. 497, *p.* 712.
Auroræ Boreales, Abstracts of several Observations on
 them, *n.* 495, *p.* 499—505.

B.

- Baker* (Mr. *Henry*) of some *Vertebrae* of *Ammonita*, or
Cornua Ammonis, *n.* 491, *p.* 37.
 ——— of the Minuteness of the Seeds in some Plants, *n.*
 494, *p.* 337.
 ——— Abstracts of several Observations of *Auroræ Bo-*
reales, *n.* 495, *p.* 499—505.
 ——— of an Earthquake at *London*, *Feb.* 8, 1749-50, *n.* 497,
p. 601. — *March* 8, 1749-50, *ib.* *p.* 617. — at *Winbourn*
 in *Dorsetshire*, *May* 4, 1749, *ib.* *p.* 689.
Ball of Fire in the Air, *n.* 497, *p.* 728.

Barker,

I N D E X.

- Barker, Esq; (Tho.)* of an extraordinary Meteor seen in Rutlandshire 1749, n. 493, p. 248.
- Barlow (Rev. Mr. Wm.)* of an Earthquake at Plymouth, Feb. 8. 1749-50, n. 497, p. 692.
- Barometer and Thermometer*, with their Extremes, at Tooting, 1749, n. 493, p. 211.—in London, *ib.* p. 213.
- the State of them on the 8th of Feb. 1749-50, in London, n. 497, p. 608.—at Tooting, *ib.* p. 609.
- Barometrorum cum aeris & tempestatum mutationibus consensus*, a S. C. Holmanno, n. 492, p. 101.
- Barrel*, a Beer Measure, n. 491, p. 55.
- Barrow, Esq; (James)* of an Earthquake at London, March 8, 1749-50, n. 497, p. 626.—near Bury St. Edmund's in Suffolk, Sept. 30, 1750, *ib.* p. 702.
- Bartram (Mr. John)* Obs. on the Dragon-fly, or *Lilella* of Pennsylvania, n. 494, p. 323. 400.
- Bas-relief* of Mithras, explained by Dr. Stukely, n. 493, p. 215.
- Baster, (John.) Descriptio Fatus monstruosi*, n. 495, p. 479.
- Beatification*, an electrical Experiment, by Prof. Bose, n. 494. p. 350.
- Bees* of, and their Method of gathering Wax and Honey, n. 496, p. 536.
- Berlin*, a Solar Eclipse there Jan. 8, 1750, obs. by Mr. Grischow and Mr. Kies, n. 494, p. 339.
- Bewis, M. D. (John)* Obs. of a Lunar Eclipse 1749, at Mr. Graham's in Fleet-street, n. 493, p. 247.—of the total Eclipse of the Moon, Dec. 2, 1750, n. 496, p. 575.
- Bezoar* of Rhinoceros, n. 492, p. 120.
- Bills* of Paper-money current among the Chinese, n. 494, p. 330.
- Birk-*(the Rev. Mr. Tho.) of an Earthquake at London, March 8, 1749-50, n. 497, p. 615.
- Blackhouse (John)* had a Calculus under his Præputium, n. 491, p. 46.
- Black Vomit*, n. 492, p. 135.
- Bladder*, a Tumour on the Inside thereof extirpated by Joseph Warner, n. 495, p. 414.

I N D E X.

- Blondeau*, Esq; (—) Remarks on the Paintings at *Herculaneum*, *n.* 491, *p.* 14.
- Borlace's* (the Rev. Mr. *Wm.*) Enquiry into Spar, and Sparry Productions, *n.* 493, *p.* 250.
- Bose* (Mr. *Geo. Matthias*) on the Electricity of Glass, *n.* 492, *p.* 189.
- of the *Apotheosis* or *Beatification* by Electricity, *n.* 494, *p.* 350.
- de *Eclips. lunar.* *Wittemb.* 19 Jan. 1750, *n.* 496, *p.* 570.
- Bowman*, Esq; (*Walter*) of an Earthquake at *East Moulsey* in *Surry*, *March* 8, 1749-50, *n.* 497, *p.* 684.
- Boyfield* (Mr.) of an Earthquake at *London*, *March* 8, 1749-50, *n.* 497, *p.* 637.
- Boza* (Mr. *Claude Gros de*) Reflections on the Medals of *Pescennius Niger*, *n.* 495, *p.* 452.
- Bridport*, of an Earthquake there, *March* 18, 1749-50, *n.* 497, *p.* 688.
- Burning of the Steeple at *Danbury* in *Essex*, by Lightning, *n.* 497, *p.* 611.
- Burrat* (*Tho.*) of an Earthquake at *Kensington*, *March* 8, 1749-50, *n.* 497, *p.* 681.
- Burrow*, Esq; (*James*) of an Earthquake in *London*, *March* 8, 1749-50, from Mr. *Boyfield*, *n.* 497, *p.* 637.—at *East-Sheen* in *Surry*, *ib.* *p.* 655.
- Burton*, M. D. (*John*) of the Extirpation of an Excrecence from the Womb, *n.* 495, *p.* 520.
- Bury St. Edmund's* in *Suffolk*, of an Earthquake near that Place, *Sept.* 30, 1750, *n.* 497, *p.* 702.
- Busbel*, the *London*, *n.* 491, *p.* 55.—the *Winchester*, *ibid.* *p.* 56.
- Butt* of Wine, &c. *n.* 491, *p.* 55.

C.

- Cadaver apertus*, & *sternus gibbosus*, per *Jo. Jac. Huber*, M. D. *n.* 492, *p.* 92.
- Calculus*, or Stone, one between the *Glans* and the *Præputium* of a Boy, *n.* 491, *p.* 45.—of a very large human, *n.* 496, *p.* 596.

Carlsbad,

I N D E X.

- Carlsbad*, the hot Springs there, *n.* 493, *p.* 219.
Caſtor in *Norfolk*; of the *Roman* Camp there, *n.* 492, *p.* 219.—the *Ruffia*, from what Animal, *n.* 493, *p.* 217.
Cat, *M. D.* (*Caud. Nic. le*) of a new Contrivance of Glaſſes for Things in ſpirituouſ Liqueurs, *n.* 491, *p.* 6.
 ——— of the Cure of dry Gangrenes, *ib.* *p.* 72. 80.
 ——— Operation of Lithotomy on Women, *n.* 492, *p.* 97.
Catalogue of the 50 Plants from *Chelſea* Garden, for the Year 1747, by *Dr. John Wilmer*, *n.* 494, *p.* 331.—for the Year 1748, *ib.* *p.* 359.—for the Year 1749, *n.* 495. *p.* 403.
Catlin (*Mr. John*) of a Lunar Eclipse, *June* 8, 1750, *n.* 496, *p.* 523.
Cave, *Bart.* (*Sir Thom.*) of an Earthquake at *Stanford Hall* *Sept.* 30, 1750. *n.* 497, *p.* 706.
Chalmers (*Mr.*) of an extraordinary Fire-ball burſting at Sea, *n.* 494, *p.* 366.
Chauncy (*Mrs.*) who had a Stone under her Tongue, *n.* 491, *p.* 5.
Chelſea, an *Aurora Australis* there, *Jan.* 20, 1749-50. ſeen by *John Martyn*, *n.* 494, *p.* 319.
 ——— of an Earthquake there, *Feb.* 8, 1749-50. *n.* 497, *p.* 609.
Cheſter, of an Earthquake there, *April* 2, 1750. *n.* 497, *p.* 683.
Chinese Accompt Table, or *Shwan-pan*, a new one, by *Mr. Smethburſt*, *n.* 491, *p.* 22.
 ——— have Paper Money current among them, *n.* 494, *p.* 330.
 ——— their Knowledge of Geography, *ib.* *p.* 328.
Clare, *Eſq;* (*Martin*) of an Earthquake at *London*, *March* 8, 1749-50, *n.* 497, *p.* 620.
Clarke (the *Rev. Rob.*) of a Boy who had a *Calculus* under the *Præputium*, *n.* 491, *p.* 45.
Clove, a Weight, *n.* 491, *p.* 66.
Cometa viſus Pekini, 1748, & obſ. ab *Aug. Hallerſtein*, *n.* 494, *p.* 307.—ab *Ant. Gaubil*, *ib.* *p.* 316.
Compaſs Mariners, deſtroy'd by the Effects of Lightning, *n.* 492, *p.* 111.—contrived by *Gowin Knight*, *M. B.* *n.* 495, *p.* 505.

I N D E X.

- Condamine (Dom. de la) de Declinatione quarundam Stellarum Australium, mense Junio 1738. n. 492, p. 159.*
Congius, a Measure of Vespasian, n. 491, p. 70.
Conjunctio Martis & Veneris Pekini Sinar. mense Mart. 1748. n. 494, p. 314. 319.
Constellatio nova, obs. Pekini, 29 Mau 1748. n. 494, p. 311.
Contraction of the Orbits of Planets, by Mr. Euler, ib. p. 356.
Cooke (Mr. Benj.) of the Mixture of the Farina of Apple-trees, n. 493, p. 205.—of the Mayze or Indian Corn, ib. p. 206.
 ——— of a Child born with the Jaundice upon it, *ibid.* p. 207.
 ——— of an Earthquake in the Isle of Wight, March 1, 1749-50, n. 497, p. 651.
Cocper, D. D. (Rev. Wm.) of the Earthquake on March 8, 1749-50, n. 497, p. 647.
 ——— of the luminous Arch, Feb. 16, 1749-50, *ibid.* p. 648.
Cornish Diamonds, an Inquiry into, n. 493, p. 251, &c.
Costa (Mr. Eman. de) of two beautiful Echinites, n. 492, p. 143.
Craicu, of the Salt Mines near that Place, n. 493, p. 228.
Cruæ Australis, ad inveniendum horam in mari noctu, n. 492, p. 141.
Crystals, or Spars, found in the Cornish Mines, n. 493, p. 251, &c.
Cycle, or Golden Number, Remarks upon, by the Earl of Macclesfield, n. 495, p. 418.
 D.
Danbury in Essex, its Steeple burnt by Lightning, n. 497, p. 611.—the Church is enter'd by the Devil, or Frier, ib. p. 612.
Dawal, Esq; (Peter) of an extraordinary Rainbow, July 15, 1748, n. 493, p. 193.
Day, a very cold, in June 1749. n. 495, p. 208.—a very hot in July 1749. ibid.
Dean in Northamptonshire, of an Earthquake there, Sept. 30, 1750, n. 497, p. 721.

I N D E X.

- Descriptio fœtus sine ullo sexus signo*, n. 495, p. 479.
Description of a Mariners Compass, contrived by *Gowin Knight*, *ib.* p. 505-512.
 ——— of a *Fish*, by *Dr. Mortimer*, *ib.* p. 518.
Diamonds, Cornish, an Enquiry into, n. 493, p. 251, &c.
 ——— true, of their Properties, *ib.* p. 272.
Dimensions of a Dwarf, and of a Child, by *David Erskine Baker*, n. 495, p. 467.
Dobbs, Elq; (*Arthur*) of Bees, and their Method of gathering Wax and Honey, n. 496, p. 536.
Doddridge, D. D. (Rev. P.) of an Earthquake at *Northampton*, n. 497, p. 712.
Dog, a mad, bites an Horse, n. 495, p. 474.
Downe (Mr. *Nath.*) of an Earthquake at *Bridport*, *March* 18, 1749-50. n. 497, p. 688.
Dragon Fly, Observations thereon, by Mr. *John Bartram*, n. 494, p. 323.
Dudley Fossil, described by *Dr. Lyttelton*, n. 496, p. 599.
 ——— by *Dr. C. Mortimer*, *ib.* p. 600.
Dunkorne (Rev. Mr. *Richard*) Acceleration of the Moon, n. 492, p. 162.
Dwarf, an Account of one, by Mr. *Wm. Arderon*, n. 495, p. 467.

E.

- Earth* in *Huntingdonskire*, of a *Lunar Eclipse*, *Dec.* 12, 1749. obs. by Mr. *Wm. Elstob jun.* n. 493, p. 280.
Earth, her gradual Approach to the Sun, *ib.* p. 204.
Earthquake at London, *Feb.* 8, 1749-50, by Mr. *H. Baker*, n. 497, p. 601.—by *Gowin Knight*, *ib.* p. 603.—by *Jo. Freeman*, Elq; *ib.* p. 605.—at *Eltham* in *Kent*, by *Wm. Fauquir*, *ib.* p. 606.—at *Tcoting*, by the Rev. *Dr. Miles*, *ib.* p. 607.—at *Chelsea*, by *Dr. John Martyn*, *ib.* p. 609.—at *Harwich*, by Mr. *Trembley*, *ib.* p. 610.
 at *Aldersbrook*, by *Smart Lethueillier*, Elq; *ib.* p. 613.
 at *Plymouth*, by Rev. Mr. *Wm. Barlow*, *ib.* p. 692.
 ——— at *London*, *March* 8, 1749-50. by *Martin Folks*, Elq; *Pr. R. S.* n. 497. p. 613.—by Rev. Mr. *Birch*, *ib.* p. 615.—by Mr. *Henry Baker*, *ib.* p. 617.—by *Dr. Layard*,

I N D E X.

- Layard*. *ib.* p. 621.—by Mr. Roger Pickering, *ib.* p. 621.—by Robert Shaw, *ib.* p. 626.—by Mich. Russel, Esq; *ib.* p. 631.—by Dr. Parsons, *ib.* p. 633.—by Mr. Boyfield, *ib.* p. 637.—by Dr. Mortimer, *ib.* p. 638. and by Rev. Dr. Cooper, *ib.* p. 647.
- Earthquake at Tooting*, March 8, 1749-50, by Dr. Mills, n. 497, p. 619. 628. 639.—at Kensington Gravel-Pits, by Martin Clare, Esq; *ib.* p. 620.—at Chelsea, by Dr. Martyn, *ib.* p. 630.—at Portsmouth, March 18, by Mr. Ellcott, *ibid.* p. 646. by Dan. Wray, Esq; *ibid.* p. 647; and by the Rev. Mr. Taylor, *ib.* p. 649.—in the Isle of Wight, March 19. by Mr. Benj. Cooke, *ib.* p. 651.—at Southampton, and those Parts, March 18 and 19, by Josiah Colebrooke, *ib.* p. 652.—at Hackney near London, March 18, by Mr. Peter Newcome, *ib.* p. 653.—at East Sheen in Surry, March 18, by James Burrow, Esq; *ib.* p. 655.—at Kensington, by Tho. Burrat, *ib.* p. 681.—at Chester, April 2, by Robert Paul, Esq; *ib.* p. 683.—at East Moulsey, March 14, by Walter Bowman, Esq; *ib.* p. 684.—in Flintshire, April 2, by Mr. Pennant, *ib.* p. 687.—at Bridport, March 18, by Mr. Nath. Downe, *ib.* p. 688.—at Winbourn in Dorsetshire, May 4, 1749, by Mr. Henry Baker, *ib.* p. 689.—in France, Octob. 11, 1749, by M. de Reaumur, *ib.* p. 691.—at Warrington in Lancashire, April 2, by Mr. Ph. Warburton, *ib.* p. 696.—at Newton in Northamptonshire, Sept. 30. by Wm. Folkes, Esq; *ib.* p. 701.—near Bury St. Edmund's in Suffolk, and at Narborough in Leicestershire, Sept. 30, by James Burrow, Esq; *ib.* p. 702. 704.—in Northamptonshire, Sept. 30, by Rev. Mr. John Nixon, *ib.* p. 705. 710. by Tho. Cave, *ib.* p. 706. by the Rev. Minister of Weston with Sutton, *ib.* p. 707. by the Rev. Dr. Doddridge, *ib.* p. 712. by Mr. —, *ib.* p. 721; and by Mr. Wm. Smith, *ib.* p. 727.—in Leicestershire, Sept. 30, by Mr. Henry Green, *ib.* p. 723.—in Lincolnshire, Aug. 23, by Maurice Johnson, Esq; and Dr. John Green, *ib.* p. 725.

Earthquakes

I N D E X.

Earthquakes happen usually in the Spring and Autumn,
n. 497, p. 624, 625.

——the Causes of, by Mr. *Stukely*, *ib.* p. 641—
646. 657. and by Dr. *Steph. Hales*, *ib.* p. 669.

——at *Smyrna*, by Dr. *Mackenzie*, n. 497, p. 700.
——the Philosophy of, by Dr. *Wm. Stukely*, *ibid.*
p. 731, &c.

Easter, the Method of finding the Time of; by the Earl
of *Macclesfield*, n. 495, p. 426.

Echinites, two beautiful, by Mr. *Eman. de Costa*, n. 492,
p. 143.

Eclipse of the *Moon*, Dec. 12, 1749. obs. at Mr. *Graham's*
in *Fleet street*, by *John Bevis*, M. D. and Mr. *James*
Short, n. 493, p. 247.—at *Erith* in *Huntingdonsbire*, by
Mr. *Wm. Elstob jun.* *ib.* p. 280.—at *Rome*, by Mr.
Christoph. Maire, n. 494, p. 322.

——total of the *Moon*, Dec. 2. 1750. obs. by Dr. *Bevis*
and Mr. *James Short*, n. 496, p. 575.

——of the *Sun*, Jan. 8, 1750. obs. at *Rome*, by Mr.
Christoph. Maire, n. 494, p. 322.—at *Berlin*, by Mr.
Griſchow jun. and Mr. *Kies*, *ib.* p. 339.—in *Surry-*
street in the *Strand*, by Mr. *John Cathn*, and Mr. *Jam.*
Short, n. 496, p. 523.

Eclipses, observed at *Grand Cairo*, n. 492, p. 164.

Eclipsis lunaris totalis Wittembergæ, 19 Junii 1750. obs.
per G. M. *Bose*, n. 496, p. 570.

Effervescence of *Steel* accounted for, by Dr. *le Cat*, n. 492.
p. 185.

Electrical Phenomena examined, by *Abbé Nollet*, n. 494,
p. 370.

Electricity cannot make *Odours* pass through *Glass*, n.
494, p. 349.

Ellicott (Mr. *John*) of Experiments made about the As-
cent of *Rockets*, n. 496, p. 578.

——of an *Earthquake* at *Portsmouth*, March 18, 1749—
50. n. 497, p. 646.

Elstob jun. Obs. of a *Lunar Eclipse* at *Erith* in *Hunting-*
donsbire, Dec. 12, 1749, n. 493, p. 280.

I N D E X.

- Eltham* in *Kent*, of an Earthquake there, *Feb.* 8, 1749-50.
n. 947, *p.* 606.
Invisions of the *Satellites* of *Jupiter*, for the Year 1751.
 By *James Hadgson*, *n.* 493, *p.* 282.
Lpices, Remarks upon, by the *Earl of Macclesfield*, *n.*
 425, *p.* 421.
Phœneus Comet e *visi Pekini Sinai.* 1748, *n.* 494, *p.* 307.
Epistola de Cadavere aperto, & de Sternu gibboso, à Jo. Jac.
Hubero, M. D. *n.* 492; *p.* 92.
Equatorial Telescope, a Description of one, by *Mr. Jam.*
Short, *n.* 493, *p.* 242.
Euler, P. M. (Leonard) of the gradual Approach of the
Earth to the *Sun*, *n.* 493, *p.* 104.
 — of the Contraction of the Orbits of the Planets,
n. 394, *p.* 356. —.
Examination of certain *Phænomena* in Electricity, *n.* 494,
p. 368.
Experimenta ad respirationem pertinentia; per Alb. Haller,
M. P. *n.* 494, *p.* 325.
Experiments on Substances resisting Putrefaction, by *Dr.*
Prinzh, *n.* 495, *p.* 480. 525. 550.—About the Ascent
 of Rockets, by *Sam. de Costa*, and others, *n.* 496. *p.* 478.
Explosion in the Air, heard at *Norwich*, *June* 7, 1750, by
Mr. W. Aderon, *n.* 497, *p.* 698.
Exstipation of a Tumour in the Bladder, by *Mr. Joseph*
Werner, *n.* 495, *p.* 417.—of an Excrecence from the
Umbilic, by *Dr. John Burton*, *ib.* *p.* 520.

F.

- Fabrie morbose in cadaveribus repertæ historiæ aliquæ, ab*
Al. Halkro, *n.* 492, *p.* 172.
Fair of Apple-trees, the Effects of the Mixture of, *n.*
 493, *p.* 205.
Fauquier, Esq. (William) of an Earthquake at *Eltham* in
Kent, *Feb.* 8, 1749-50, *n.* 497, *p.* 605.
Fetus, turned inwards in the Birth, brought to rights, *n.*
 493, *p.* 240.
Fermentation of Steel accounted for, *n.* 492, *p.* 185.

Fire-

I N D E X.

- Fire-bal'*, an extraordinary, bursting at Sea; obs. by Mr. Chalmers, *n.* 494, *p.* 366.
- Fire-wood*, of the green Mould thereon, *n.* 494, *p.* 324.
- Fish* leap out of the Water, *n.* 497, *p.* 637.
- Flintshire*, of an Earthquake there, April 2, 1750, *n.* 497, *p.* 687.
- Fetus in utero* differently affected by the Small-Pox, *n.* 493, *p.* 235.
- *monstrosi Descriptio*, per Job. Paster, *n.* 495, *p.* 479.
- Folkes*, Esq; (Martin) Pr. R. S. of an Earthquake at London, March 8. 1749-50, *n.* 497, *p.* 613.
- (Wm.) of an Earthquake at Newton in Northamptonshire, Sept. 30, 1750, *ib.* *p.* 701.
- Forceps* for the Extirpation of Tumours too remote from the Surgeons Fingers; by Dr. le Cat, *n.* 491, *p.* 80.
- for extracting Stones, and other foreign Bodies, where the common are of no Use, *ib.* *p.* 84.
- Fort River*, irregular Tide there, *n.* 495, *p.* 412.
- Fournaise* (Mrs.) cured of a dry Gangrene, *n.* 491, *p.* 74.
- Fracture* of the Arm, an extraordinary Case of, by Mr. John Freke, *n.* 494, *p.* 398.
- France*, of an Earthquake there, Oct. 11, 1749, *n.* 497, *p.* 691.
- Freeman*, Esq; (Wm.) of a Stone under the Tongue of a Clergyman's Lady, *n.* 491, *p.* 5.
- of an Earthquake at London, Feb. 8, 1749-50, *n.* 497, *p.* 605.
- Freke* (Mr.) an extraordinary Case of a Fracture of the Arm, *n.* 494, *p.* 397.
- G.
- Gallon Wine*, *n.* 491, *p.* 55. Ale, *ib.* *p.* 59.
- Gangrenes* dry, of their Cure, by Dr. le Cat, *n.* 491, *p.* 72.
- Garcin*, M. D. (Lawrence) of the *Salvadora*, a new Genus of Plants, *n.* 491, *p.* 47.
- Gaubil* (Rev. P. P. Anton.) de Cometa viso Pekini, 1748. *n.* 394, *p.* 316.
- of the Knowledge of Geography among the Chinese, *n.* 494, *p.* 327.

I N D E X.

- Glass*, Electricity of, *n.* 492, *p.* 189.
 ———admits not Odours to pass through it by Electricity, *n.* 494, *p.* 349.
Glass-drops, a Memoir on, by Dr. *le Cat*, *n.* 492, *p.* 175.
Glasses for preserving Things in Spirits, a new Invention, *n.* 491, *p.* 6, 83.
Globes, large, prepared by Mr. *John Senex*, are sold by his Widow, *n.* 423, *p.* 290.
Glory, or *Beatification*, by Electricity, *n.* 494, *p.* 350.
Golden Number, Remarks upon by the Earl of *Macclesfield*, *n.* 495, *p.* 418.
Graham's in *Fleet-street*, Obs. of a *Lunar Eclipse* there, by Dr. *J. Bevis*, and Mr. *James Short*, *n.* 493, *p.* 247.
Grand Cairo, Eclipses observed there, *n.* 492, *p.* 165.
Greek Inscription, explained by *J. Ward*, *n.* 495, *p.* 488.
Green (Mr. *Henry*) of an Earthquake, Sept. 30, 1750, *n.* 497, *p.* 721.
 ———Dr. *John*, of an Earthquake at *Spalding* in *Lincolnshire*, Aug. 23, 1750, *n.* 497, *p.* 725.
Grisebow's jun. (Mr.) Obs. of a *Solar Eclipse* at *Berlin*, Jan. 8, 1750, *n.* 404, *p.* 339.
 H.
Hackney near *London*, of an Earthquake there, by Mr. *Peter Newcome*, *n.* 497, *p.* 653.
Hales, D. D. (Rev. *Steph.*) Examination of the Strength of the principal-Purging Waters, *n.* 495, *p.* 446.
 ———on the Causes of Earthquakes, *n.* 497, *p.* 669.
Halleri, M. P. (*Alberti*) *Fabricæ morbosæ in cadavere repositæ historię aliquæ*, *n.* 492, *p.* 170.
 ———*Experimenta ad respirationem pertinentia*, *n.* 494, *p.* 325.
 ———*de viis seminis*, *n.* 494, *p.* 340.
Hallerstein (*Augustin.*) Obs. *Cometæ visæ Pekini*, 1748. *n.* 494, *p.* 305.
Halley's (Dr.) Demonstration of the Analogy of the Logarithms, Tangents, &c. explained by Mr. *John Robertson*, *n.* 496, *p.* 559-569.
Halo, or *Mock Sun*, obs. by Mr. *Wm. Arderon*, *n.* 493, *p.* 203.
 Harwich,

I N D E X.

- Harwich*, of an Earthquake there, *Feb.* 8, 1749-50, *n.* 497, p. 610.
- Heat of the Weather in July and September*, 1750, by Dr. Baker, *n.* 496, p. 571.—Extraordinary in *February*, 1749-50, *n.* 497, p. 619.
- Herden*, M. D. (*Wm.*) of a very large human *Calculus*, *n.* 496, p. 596.
- Herculaneum*, Remarks on the Paintings there, by Mr. Blondeau, *n.* 491, p. 14.
- Hexagonal Shape of Spars*, whence, *n.* 493, p. 264.
- Hodgson* (*James*) Immersions and Emergions of *Jupiter*, for the Year 1751, *n.* 493, p. 282—289.
- Hogshead*, a Measure, *n.* 491, p. 55.
- Holmannus* (*Sam. Christian.*) de *Barometrorum cum aeris & tempestatum mutationibus consensu*, *n.* 492, p. 101.
- Honey and Wax*, how gathered by the Bees, *n.* 496, p. 536.
- Horse* bit by a mad Dog, *n.* 495, p. 474.
- Hour of the Day*, how to find, *n.* 493, p. 244.
- Huberus*, M. D. (*Joh. Jac.*) de *cadavere aperto*, & de *sterno gibbofo*, *n.* 492, p. 92.
- Hundred*, a Weight, *n.* 491, p. 66.
- Huxham*, M. D. (*John*) Obs. on the Northern Lights, seen *Feb.* 15 and 16, 1749-50, *n.* 495, p. 472.
- J.
- Jaundice*, a Child born with, *n.* 493, p. 207.
- Jeffop's Well* Purging Water examined, *n.* 495, p. 447-451.
- Immersions and Emergions of the Satellites of Jupiter*, for the Year 1751. by *James Hodgson*, *n.* 493, p. 282.
- Impostume*, an extraordinary in a Lady's Stomach, *n.* 495, p. 406.
- Improvements of Dr. Knight's Mariners Compass*, by *John Smeaton*, *n.* 495, p. 513.
- Incrustations of Spars, or Crystals*, *n.* 493, p. 259.
- Indian Corn*, the Effect of the Mixture of its *Farina*. *n.* 493, p. 206.
- Inscription*, a *Roman*, remarked upon by Mr. *John Ward*, *n.* 494, p. 293.
- Inscription.*

I N D E X.

- Inscription*, an antient *Greck*, explained by *John Ward*, n. 495, p. 488.
- Insect*, a putrified, described by *Dr. Lyttelton*, n. 496, p. 598.
- Inundation*, a surprizing in *Cumberland*, 1749, n. 494, p. 362.
- Jovis & Veneris Congressus* Pekini, *Jan.* 1, 1748, n. 494, p. 315.
- Isle of Wight*, of an Earthquake there, *March* 19, 1749-50, n. 497, p. 651.
- Italy*, Travels through, by *Rob. More*, Esq; n. 495. p. 464.
K.
- Kensington*, of an Earthquake there, *March* 8, 1749-50. n. 497. p. 681.
- Kies*, (M.) of an Eclipse of the *Sun*, *Jan.* 8, 1750, obs. at *Berlin*, n. 494. p. 339.
- Kingston* in *Jamaica*, its Longitude determined, n. 496, p. 523.
- Knight*, M. B. (Gowin) Remarks on the Effects of Lightning, in destroying the Polarity of a Mariners Compass, n. 492, p. 113.
- Contrivance of a Mariners Compass, n. 495, p. 505.
- His Mariners Compass improved by *John Smeaton*. n. 495, p. 513.
- of an Earthquake at *London*, *Feb.* 8. 1749-50, n. 497, p. 603.
- Knowledge* of Geography among the *Chinese*, n. 494, p. 328.
L.
- Lacrymæ Batavicae*, a Memoir on, by *Dr. le Cat*, n. 492, p. 175.
- Lambeth*; of *John Tradescant's* Garden there, by *Mr. W. Watson*, n. 492, p. 160.
- Part of a Roof flung down there by an Earthquake, *March* 8, 1749-50, n. 497, p. 700.
- Lateral Operation* for the Stone; a Proposal to remove its Defects, n. 491, p. 24.
- Layard*, M. D. (*Daniel Peter*) of an extraordinary Impostume in a Lady's Stomach, n. 495, p. 406.
- Layard*,

I N D E X.

- Layard, M. D. (Peter Daniel)* of an Earthquake at *London*, *March* 8, 1749-50, *n.* 497. *p.* 621.
- Leiceſtershire*, of an Earthquake there, *Sept.* 30, 1750, *n.* 497, *p.* 723.
- Lethieullier Elq; (Smart)* of the Burning of the Steeple at *Danbury*, by Lightning; and of the Earthquake, *n.* 497, *p.* 611.
- Libella*, or *May Fly* of *Penſylvania*; *Obſ.* thereon, by *Mr. John Bartram*, *n.* 494, *p.* 323, 401.
- Life of Pſcennius Niger*, with ſome Circumſtances in the *History* thereof; by *Monſ. de Boze*, *n.* 495. *p.* 45.
- Light* of *Rockets*, at what *Distance* it may be ſeen, *n.* 496, *p.* 578.
- Lightning*; its *Effects* in deſtroying the *Polarity* of a *Mariners Compaſs*, *n.* 492, *p.* 111.
- burns the Steeple at *Danbury* in *Effex*, *n.* 497, *p.* 611.
- Lithotomy* on *Women*, the *Operation* of, by *Dr. le Cat*, *n.* 492, *p.* 97.
- Locuſts*, of the *Damage* they did in *Walackia*, *Moldavia*, and *Transilvania*, in 1747 and 1748; and in *Hungary* and *Poland* in 1748, *n.* 491, *p.* 30.
- Logarithmic Tangents* analogous to the *Meridian Line*, *n.* 496, *p.* 559.
- London*, of an Earthquake there, *Feb.* 8, 1749-50, *n.* 497, *p.* 601. 603. 605.
- Longitude* of *Kingſton* in *Jamaica* determined. *n.* 495, *p.* 523.
- Luminous Arch* *Feb.* 16, 1749. *obſ.* by *Dr. Cooper*, *n.* 497, *p.* 647.
- Lunar Year*, *Remarks* upon, by the *Earl of Maccleſfield*, *n.* 495, *p.* 418.
- Lunæ Eclipſis*, *obſ.* in *Paraquaria*, *Feb.* 24, & *Aug.* 19, 1747, *n.* 491, *p.* 8.
- *Julii* 28, 1748, *obſ.* *Madriti*, *n.* 491, *p.* 10.
- Lunæ & Martis Occultatio*, *Pekini*, *Dec.* 6, 1747, *n.* 493, *p.* 312.
- Lyttelton, LL. D. (Rev. Charles)* of a non-deſcript petrified Inſect, *n.* 496, *p.* 598.

I N D E X.

M.

- Macclesfield* (Earl of) Remarks upon the Solar and Lunar Years, &c. *n.* 495, *p.* 417—434.
- Mackenzie* (Mr. *Murdock*) of the Tides in *Orkney*, *n.* 492, *p.* 149.
- of Earthquakes at *Smyrna*, *n.* 497, *p.* 700.
- Maire* (Mr. *Christopher*) Obs. of the Eclipse of the Moon, *Dec.* 23, 1749; and that of the Sun, *Jan.* 8, 1750, *n.* 494, *p.* 321.
- Manna*, the Method of gathering it near *Naples*, *n.* 495, *p.* 470.
- Mariners* Compass, contrived by *Gowin Knight*, *n.* 495, *p.* 505.
- proposed by *Dr. Knight*, improved by *J. Smeaton*, *n.* 495, *p.* 513.
- Mark*, a Weight, *n.* 491, *p.* 65.
- Martis* & *Lunæ Occultatio Pekini*, *Dec.* 6, 1747, *n.* 494, *p.* 312.
- Martis* & *Veneris Conjunctio Pekini*, *mense Martio* 1748. *ibid.* *p.* 314.
- Martyn*, M. D. (*John*) of an *Aurora Australis*, seen at *Chelsea*, *Jan.* 23, 1749-50. *n.* 494, *p.* 319.
- of an *Aurora Borealis*, *Feb.* 16, 1749-50, *n.* 494, *p.* 345.
- of an Earthquake at *Chelsea*, *Feb.* 8, 1749-50, *n.* 497, *p.* 609.—*March* 8, 1749-50, *ib.* *p.* 630.
- May Flies* of *Pensilvania*, by Mr. *John Bertram*, *n.* 494, *p.* 401.
- Mayze*, the Effects of the Mixture of its *Farina*, *n.* 493, *p.* 206.
- Measures* of Capacity, of the *English*, by Mr. *Reynardson*, *n.* 491, *p.* 54. *Roman*, *ib.* *p.* 70.
- dry, *n.* 491, *p.* 65.
- Medals* of *Pescennius Niger*, Reflections on: *n.* 495. *p.* 452.
- Meridian* of a Place, how to find, *n.* 493, *p.* 244.
- Line or Sum of the Secants, analogous to Logarithmic Tangents, *n.* 496, *p.* 559.
- Meteor*, an extraordinary, seen in *Rutlandshire*, 1749, *n.* 493, *p.* 248. *Miles*,

I N D E X.

- Miles*, D. D. (Rev. *Henry*) of Thermometers, and of the Weather, *n.* 491, *p.* 1.—of some *Vertebrae* of *Ammonoites*, *ib.* *p.* 37.—of a very cold Day, and another very hot Day, in *June* and *July* 1749, *n.* 493, *p.* 208.—of the green Mould on Fire-wood, *n.* 494, *p.* 334.—of an *Aurora Borealis*, *Jon.* 23, 1750-51, *ib.* *p.* 346.—of the Heat of the Weather in *July* and *September* 1750, *n.* 496, *p.* 571.—of an Earthquake at *Toting*, *Feb.* 8, 1749-50, *n.* 497, *p.* 607. *March* 8, 1749-50, *ib.* *p.* 628.—State of the Barometer and Thermometer at *London* and *Toting*, *Feb.* 8, 1749-50, *n.* 497, *p.* 608, 609. of extraordinary Heat in *February*; and of the Earthquake in that Month, 1749-50, *ib.* *p.* 619.—of an Earthquake *Sept.* 30, 1750, *ibid.* *p.* 726.
- Miller* (Mr. *Jos.*) a Catalogue of the 50 Plants from the Apothecaries Company, for 1746, *n.* 491, *p.* 43.
- Milner*, Esq; (*Wm.*) Case of *Nic. Recks's* being born with his Feet inwards, and brought to rights, *n.* 493, *p.* 239.
- Mines* in *Cornwall* have *Spar*, or *Crystals*, *n.* 493, *p.* 250.—their Direction in them. *ib.* *p.* 275.
- Mithras*, a Bas-relief of, found at *York*, *n.* 493, *p.* 214.
- Mock Sun*, obsl. at *Norwich*, *n.* 493, *p.* 203.
- Molesey*. See *East Molesey*.
- Moneyers Pound*. *n.* 491, *p.* 67.
- Monnier* (*Tbo. le*) cured of a dry Gangrene. *n.* 491, *p.* 77.
- Moon*, of her Acceleration; by the Rev. Mr. *Dunthorne*, *n.* 492, *p.* 162.
- Morbus Strangularius*, by Dr. *John Starr*, *n.* 495, *p.* 436—446.
- More*, Esq; (*Robert*) Remarks in his Travels thro' *Italy*, *n.* 495, *p.* 464.
- Method of gathering *Manna* near *Naples*, *n.* 465, *p.* 470.
- Mortimer*, M. D. (*Cromwell*) Case of a Lady, touching the Small-Pox, *n.* 493, *p.* 233.—Description of a Fish, *n.* 495, *p.* 518.—of a small flat spheroidal Stone, *n.* 496, *p.* 602.*
- Mould*, of the green, on Fire-wood, *n.* 494, *p.* 334.

I N D E X.

Mounſey, M. D. (*James*) of the *Ruffia* Caſtor, n. 493,
p. 217.

Mudge (Mr. *John*) a Propoſal to remove the only real
Defect in the lateral Operation for the Stone, n. 491,
p. 24.

N.

Naples, the Method of gathering Manna near that Place,
n. 495, p. 470.

Narborough in *Leiceſterſhire*, of an Earthquake there Sept.
30, 1750, n. 497, p. 704.

Newcome (Mr. *Peter*) of an Earthquake at *Hackney* near
London, March 18 and 19, n. 497, p. 653.

Newton in *Northamptonſhire*, of an Earthquake there Sept.
30, 1750. n. 497, p. 701.

Nixon (Rev Mr. *John*) of an Earthquake Sept. 30, 1750,
n. 497, p. 706. 710. 728.

Nollet (l'Abbé) Examination of certain Phœnomena in
Electricity, n. 497, p. 368.

Norfolk, of the Roman Camp there at *Caſtor*, n. 493,
p. 196.

Northern Lights Feb. 15 and 16, 1749-50, obſ. by Dr.
John Huxham, n. 495, p. 472.

Northampton, of an Earthquake there Sept. 30, 1750. by
Dr. *Doddridge*, n. 497, p. 712.

Norwich, a Halo, or Mock Sun obſ. there, by Mr. *Arden-*
ron, n. 493, p. 203.—An Exploſion in the Air heard
there, June 7, 1750, n. 497, p. 698.

O.

Observationes aliquæ Aftronomiæ, à P. *Suarez*, & S. J. in
Paraquaria habitæ 1747. n. 491, p. 8.

————— *variæ Pekini Sin.* 1748, n. 494, p. 305—319.

Observations on the Northern Lights Feb. 15 and 16,
1749-50, by J. *Huxham*, n. 495, p. 472.

Observatory, the portable; or the Equatorial Telescope,
n. 493, p. 242.

Oculatio Martis & Lunæ Pekini, Dec. 6, 1747. n. 494,
p. 312.

Odoars do not paſs through Glaſs by Electricity, n. 494,
p. 348.

I N D E X.

Orbits of Planets, their Contraction, n. 494, p. 356.

Orkney, of the Tides there, by Mr. Mackenzie, n. 492, p. 149.

P.

Paintings at Herculaneum, Remarks on them, n. 491, p. 14.

Paper Money current among the Chinese, n. 494, p. 330.

Papers, several, concerning a new Semi-Metal, called Platina, n. 496, p. 584—596.

Paraguaria, Obs. Astronomica ibidem habitæ, 1747. per Jesuitas, n. 491, p. 8.

Parsons, M. D. (James) of the Rana Piscatrix, n. 492, p. 126.

Paschal Limits (Gregorian) shewn by the Earl of Macclesfield, n. 495, p. 431.

Peck, a Measure, n. 491, p. 65.

Pennant (Mr.) of an Earthquake in Flintshire, April 2, 1750, n. 497, p. 687.

Pescennius Niger, Reflections on his Medals, n. 495, p. 452.

Philosophy of Earthquakes, by Dr. Wm. Stukely, n. 497, p. 731, &c.

Phænomena (certain) in Electricity examined, by Abbe Nollet, n. 494, p. 370—397.

Pietra de Mombazza, or the Rhinoceros Bezoar, n. 492, p. 119.

—de Cobra de Cabelos, or pretended Serpent-stone, ib. p. 121.

Pipe, or But of Wine, &c. n. 491, p. 55.

Planet, or Star, to find at Noon-day, n. 493, p. 245.

Planets, of the Contraction of their Orbits, n. 494, p. 356.

Plants, a Catalogue of the 50 from the Apothecaries Company, for the Year 1746, n. 491, p. 43.—for the Year 1747, n. 494, p. 331.—for the Year 1748, ib. p. 359.—for the Year 1749, n. 495, p. 403.

Platina, a new Semi-Metal, n. 496, p. 584.

Platt (Mr. Joseph) of a spheroidal Stone, n. 496, p. 534.

Plymouth, of an Earthquake there, Feb. 8, 1749-50, n. 497, p. 693.

I N D E X.

- Polarity of a Mariners Compass destroyed by the Effects of Lightning*, n. 492, p. 111.
- Portable Observatory, or the Equatorial Telescope*, n. 493, p. 242.
- Portsmouth*, of an Earthquake there, *March* 18, 1749-50, by Mr. *John Ellicott*, n. 497, p. 646.—by *Dan. Wray*, Esq; *ib.* p. 647.—by Mr. *Taylor*, *ib.* p. 649.
- Pottle*, a Measure, n. 491, p. 65.
- Pringle, M. D. (John)* Experiments on Substances resisting Putrefaction, n. 495, p. 480. 525. 550.
- Purging Waters*, the Strength of several examined, by Dr. *Stephen Hales*, n. 495, p. 446.
- Putrefaction*, what Substances resist it, n. 495, p. 480. and n. 496, p. 525. 550 —What hasten and promote it, *ib.* p. 553.

Q.

- Quadrantal*, a Roman Measure. n. 491, p. 70.
- Quarter*, of London, *ib.* p. 65.
- Queries* concerning the Tides in a large Ocean, n. 492, p. 158.

R.

- Rainbow*, an extraordinary, obs. *July* 15, 1748, by *Peter Deval*, Esq; n. 493, p. 193.
- Rana Piscatrix*, by Dr. *James Parsons*, n. 492, p. 126.
- Reaumur (M. de)* of an Earthquake in *France*, *Octob.* 11, 1749, n. 497, p. 691.
- Recks's (Nicolas)* Case, touching his being born with his Feet turned inwards, n. 493, p. 239.
- Reflections* on the Medals of *Pescennius Niger*, by M. le *Boze*, n. 495, p. 452.
- Remarks* on the Effects of Lightning, in destroying the *Polarity of a Mariners Compass*, n. 492, p. 113.
- made in his Travels through *Italy*, by *Rob. More*, Esq; n. 495, p. 464.
- Respirationis Experimenta aliqua*, per *Alb. Haller*, n. 494, p. 325.
- Reynardson*, Esq; (*Samuel*) of *English Weights*, and Measures of Capacity, n. 491, p. 54.

Rhinoceros

I N D E X.

- Rhinoceros Bezoar*, *n.* 492, *p.* 120.
Robertson (Mr. *John*) of the Analogy of Logarithmic
 Tangents to the Meridian Line, *n.* 496, *p.* 559.
Robins (Mr. *Benjamin*) Obs. on the Height to which
 Rockets ascend, *n.* 492, *p.* 131. *n.* 496, *p.* 578; and,
 to what Distance their Light may be seen, *ib.* *p.* 582.
Roman Inscription, Remarks upon, by Mr. *John Ward*,
n. 494, *p.* 293.
Rondè (Mr.) dry Gangrene stopt, *n.* 491, *p.* 75.
Russel, Esq; (*Michael*) of an Earthquake at *London*,
March 8, 1749-50, *n.* 497, *p.* 631.
Russia Castor, the true Sort, *n.* 493, *p.* 217.
Rutlandshire, an extraordinary Meteor seen there, *n.* 493,
p. 248.

S.

- Sack*, of Wool, *n.* 491, *p.* 66.
Salt Mines near *Cracau*, *n.* 493, *p.* 228.
Salvadora, a new Genus of Plants, by Dr. *Garcin*, *n.* 491,
p. 47.
Sayer (Mr. *J.*) of Mr. *Smitb's* Cafe; the Coats of his Sto-
 mach turned into a cartilaginous Substance, *n.* 491,
p. 30.
Sedden (Rev. Mr. *John*) of an Earthquake at *Warrington*
 in *Lancashire*, *April* 2, 1750, *n.* 497, *p.* 695.
Sediments found in some particular Purgings Waters, *n.*
 495, *p.* 446.
Seeds, their Minuteness in some Plants, *n.* 494, *p.* 337.
Seminus viæ, obs. per *Albert Haller*, *n.* 494, *p.* 340.
Semi-Metal, a new, called *Platina*, *n.* 496, *p.* 584.
Senex (Mrs.) sells large Globes, prepared by her late Hus-
 band, *n.* 493, *p.* 290.
Serpent-stone, of the pretended, by Sir *Hans Sloane*, Bart.
n. 492, *p.* 118.
Short (Mr. *James*) Description and Uses of an Equatorial
 Telescope, *n.* 493, *p.* 242.
 ——— of an Eclipse of the *Moon*, obs. at Mr. *Graham's* in
Fleet-street, 1749. *n.* 493, *p.* 247.

I N D E X.

- Short*, of an Eclipse of the *Moon*, *June* 8, 1750, *n.* 496, *p.* 523. — of the total Eclipse of the *Moon*, *Dec.* 2, 1750, *n.* 496, *p.* 575.
- Sloane*, *Bart.* (*Sir Hans*) of the pretended *Serpent-stone*, &c. *n.* 432, *p.* 118.
- Small Pox* differently affect the *Fœtus in utero*, *n.* 493, *p.* 236.
- appear in a Child two Days after its Birth, *n.* 493, *p.* 234.
- Smeaton* (*John*) Improvements of *Dr. Knight's* Mariners Compaſs, *n.* 495, *p.* 513.
- Smethurst* (*Gamaliel*) of a new-invented *Shwan-pan*, or *Chinese Accompt-Table*, *n.* 491, *p.* 22.
- Smith* (*Mr.* —) his Case, the Coats of his Stomach turned into a cartilaginous Substance, *n.* 491, *n.* 39.
- (*Mr. William*) of an Earthquake at *Peterborough*, *Sept.* 30, 1750, *n.* 497, *p.* 728.
- Smyrna*, of an Earthquake there, by *Dr. Mackenzie*, *n.* 497, *p.* 700.
- Solar Year*, Remarks upon, by the *Earl of Macclesfield*, *n.* 495, *p.* 417.
- Solis Eclipsis*, *Julii* 14, 1748, obſ. *Madriti*, *n.* 491, *p.* 10.
- Southampton*, an Earthquake there, and in the Parts adjacent, *March* 18 and 19, 1749-50, *n.* 497, *p.* 652.
- Spalding* in *Lincolnſhire*, an Earthquake there, *Aug.* 23, 1750, *n.* 497, *p.* 725.
- Spar*, an Inquiry into its original State and Property, its Fluidity, and different Appearances, by *Rev. Mr. Borlace*, *n.* 493, *p.* 250, 255. 257.
- Spars*, or *Cryſtals*, plain, *n.* 493, *p.* 258. Their Incruſtations, *ib.* *p.* 259. their hexagonal Shape, *p.* 264. Size, *p.* 268. Colour, *p.* 270. Hardneſs, *p.* 272.
- Springs*, the hot at *Carlsbad*, *n.* 493, *p.* 219.
- Stanford Hall* in *Northamptonſhire*, an Earthquake there, *Sept.* 30, 1750, *n.* 497, *p.* 706.
- Star*, or Planet, to find at Noon-day, *n.* 493, *p.* 245.
- Starr*, *M. D.* (*John*) of an Horſe bit by a mad Dog, *n.* 495, *p.* 474.

Starr,

I N D E X.

- Starr*, of the *Morbus strangulatorius*, n. 495, p. 435.
- St. John's* in *Cumberland*, a surprising Inundation in the Valley thereof, 1749, n. 494. p. 363.
- Steel*, the tempering accounted for, n. 492, p. 184.
- Steeple* of *Danbury* in *Essex* burnt by Lightning, n. 497, p. 611.
- Stellarum quarundam australium Declinationes*, mense *Junio* 1738, per *Dom. de la Condamine*, n. 492, p. 139.
- Sterling*, a round, n. 491, p. 55.
- Steward* (Mr.) of an Earthquake at *Deen* in *Northamptonshire*, *Sept.* 30, 1750, n. 497, p. 721.
- Stomach*, its Coats turned into a cartilaginous Substance, n. 491, p. 39.
- an extraordinary Impostume formed therein, n. 495, p. 406.
- Stone* under the Tongue of a Lady, n. 491, p. 5.
- the lateral Operation for it; Mr. *Mudge's* Proposal to remove the Defects of it, n. 491, p. 24.
- a Weight, n. 491, p. 66.
- a flat spheroidal, by Mr. *Joseph Platt*, n. 496, p. 534.
- a small flat spheroidal, by Dr. *Mortimer*, n. 496, p. 602.*
- Strength* of several Purgings Waters examined, by Dr. *Hales*, n. 495, p. 446.
- Struijck* (*Nicol.*) *de Viis Comatarum*, n. 492, p. 89.
- Stinkely*, M. D. (Rev. *Wm.*) Explanation of a Bas-relief, found at *Tork*, n. 493, p. 214.
- of the Causes of Earthquakes, n. 497, p. 641. 657.
- Philosophy of Earthquakes, *ib.* p. 731.
- Suarez*, e *Soc. J.* (*P. Bomaventura*) *Observationes Astro-nomicæ*, 1747, n. 491, p. 8.
- Substances* resisting Putrefaction, n. 495, p. 480. n. 496, p. 525. 550.
- Sun* eclipsed *Jan.* 8, 1750, obs. at *Rome*, by Mr. *Christoph. Maire*, n. 494, p. 322.—at *Berlin*, by Mr. *Grischow jun.* and Mr. *Kies*, *ibid.* p. 339.—by Mr. *John Catlin*, and Mr. *James Short*, n. 496, p. 523.

I N D E X.

T.

- Tangents* Logarithmic, analogous to the Meridian Line, n. 496, p. 559.
- Taunton* in *Somersetshire*, an Earthquake there, *July* 1, 1749, n. 497, p. 690.
- Taylor* (Rev. Mr.) of an Earthquake at *Portsmouth*, *March* 18, 1749-50, n. 497, p. 649.
- Telescope*, the Equatorial, its Uses, n. 493, p. 244, 245.
- Tempering* of Steel accounted for, n. 492, p. 176.
- Tertian*, a Wine-measure, n. 491, p. 55.
- Thermometer* and *Barometer*, with their Extremes, at *Tooting*, 1749, n. 493, p. 211. in *London*, *ib.* p. 213.
- the State of, on the 8th of *February* 1749-50, at *London*, n. 497, p. 608. at *Tooting*, *ib.* p. 609.
- Thermometers*, Dr. *Miles* of, n. 491, p. 1. — of Quick-silver the best, *ib.* p. 2.
- their near Agreement in *London* and at *Tooting*, n. 493, p. 208.
- Tides* in *Orkney*, by Mr. *Murdock Mackenzie*, n. 492, p. 149.
- in a large Ocean; *Queries* concerning them, *ibid.* p. 158.
- of an irregular in the River of *Forth*, by Mr. *Edward Wright*, n. 495, p. 412.
- Tongue*, a Stone under it, n. 491, p. 5.
- Tooting*, of an Earthquake there *Feb.* 8, 1749-50, n. 497, p. 607.
- Tradescant's Garden* at *Lambeth*, some Account of, by *W. Watson*, n. 492, p. 160.
- Travels* through *Italy*, by *Rob. More*, Esq; n. 495, p. 464.
- Troy Pound*, n. 491, p. 57. 59. whence its Name, *ib.* p. 69.
- Tumour* on the Bladder, extirpated by Mr. *Joseph Warner*, n. 495, p. 414.
- Tumours* out of the Reach of the Surgeon's Fingers, an Instrument for the Extirpation of them; by Dr. *le Cat*, n. 491, p. 72. 80.
- Tun* of Wine, Oil, Honey, *ib.* p. 55.

I N D E X.

V.

- Valley of St. John's* in Cumberland, a surprising Inundation there, 1749, n. 494, p. 363.
Veneris & Martis Conjunctio Pekini, mens. Mart. 1748, n. 494, p. 314.
 — *& Jovis Congressus* Pekini, Jan. 1, 1748, ib. p. 315:
Vesica fellica non exiit in cadavere aperto, n. 492, p. 92.
Via Cometarum, per Nic. Struik, n. 492, p. 89.
 — *Seminis*, obs. per Alb. Haller, n. 494, p. 340.
Ulloa (Antonius de) *Observ. Eclips. Solaris*, Jul. 14, & Lunæ, Jul. 28, 1748. *Madriti*, n. 491, p. 10.
 — of the *Vomito prieto*, or the black Vomit, n. 422, p. 134, 135.

W.

- Waddell* (Capt. John) of the Effects of Lightning on a Mariners Compass, n. 492, p. 111.
Ward (John) Attempt to explain an antient Greek Inscription, n. 495, p. 488.
Warner (Mr. Joseph) of a Tumour growing on the Inside of the Bladder, n. 495, p. 414.
Warrington in Lancashire, an Earthquake there, April 2, 1750, n. 497, p. 695.
Water-spout, a Meteor resembling one, n. 493, p. 248.
Watson (Mr. W.) of John Tradescant's Garden at Lambeth, n. 492, p. 160. — of the *Fœtus in utero* being differently affected by the Small Pox, n. 493, p. 235. — of Odours not passing thro' Glass, by Electricity, n. 494, p. 348. — of a new Semi-Metal, called *Platina*, n. 496, p. 584.
Wax and Honey, how gathered, n. 496, p. 536.
Weather, Dr. Mules, Obs. of, n. 491, p. 1.
 — of hot, in July and September 1750, by Dr. Miles, n. 496, p. 571
 in July 1750, by Mr. Anderson, ib. p. 573.
Wesson with Sutton, in Northamptonshire, of an Earthquake there, Sept. 30, 1750, n. 497, p. 707.
Weights of the English, by Mr. Reynardson, n. 491, p. 34.
 — Troy and Avoirdupois, their Difference, n. 491, p. 59.

I N D E X.

p. 59. of a cubic Foot of Spring Water, *ib.* *p.* 63. Apothecaries, *ib.* *p.* 66. Goldsmiths, *ibid.*

Wey of Cheese, *n.* 491, *p.* 66.

Wilmer, M. D. (*John*) Catalogue of the 50 Plants from *Chelsea* Garden, for the Year 1747, *n.* 494, *p.* 331.—for the Year 1748, *ib.* *p.* 359.—for the Year 1749, *ib.* 403.

Winbourn in *Dorsetshire*, of an Earthquake there, *May* 4, 1749, *p.* 689.

Womb, an Excrecence from thence extirpated by Dr. *John* Burton, *n.* 495, *p.* 520.

Women, the Operation of *Lithotomy* on them, by Dr. *le Cat*, *n.* 492, *p.* 97.

Wray, Esq; (*Daniel*) of an Earthquake at *Portsmouth*, *March* 18, 1749-50, *n.* 497, *p.* 646, 647.

Wright (Mr. *Edward*) of an irregular Tide in the River of *Forth*, *n.* 495, *p.* 412.

Y.

York, a Bas-relief of *Mitbras* found there, *n.* 493, *p.* 214.

F I N I S.

ERRATA in Vol. XLVI. of *Philos. Transactions*.

Transact. N^o 490. p. 613. l. 10. for *Walling* read *Shalford Farm*
(adjoining to *Wasing*) in the Parish of *Brimpton*.

Transact. N^o 494. p. 295. l. 2. for 1702. read 1699. P. 301. l. 29.
and p. 304. l. 15. for *Rinefus* read *Reinefs*.

Transact. N^o 495. p. 491. l. 17. and p. 496. l. 5. for ΜΑΡΑΘΝΙΟΞ
read ΜΑΡΑΘΩΝΙΟΣ. P. 495. l. 23. for *Litbieullier* read *Lethieullier*.
P. 499, Note, l. 6. for ΝΙΚΟΜΗΔΟΥΣ read ΝΙΚΟΜΗΔΟΥ.

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